...ber, 1955 ... TWO SHILLINGS & SIXPENCE

Plastics

DEALING WITH THE MANUFACTURE, USES AND POTENTIALITIES OF PLASTIC MATERIALS

PUBLIC LIBRARY
JAN 1 6 1953
DETROIT

Plastics with a background

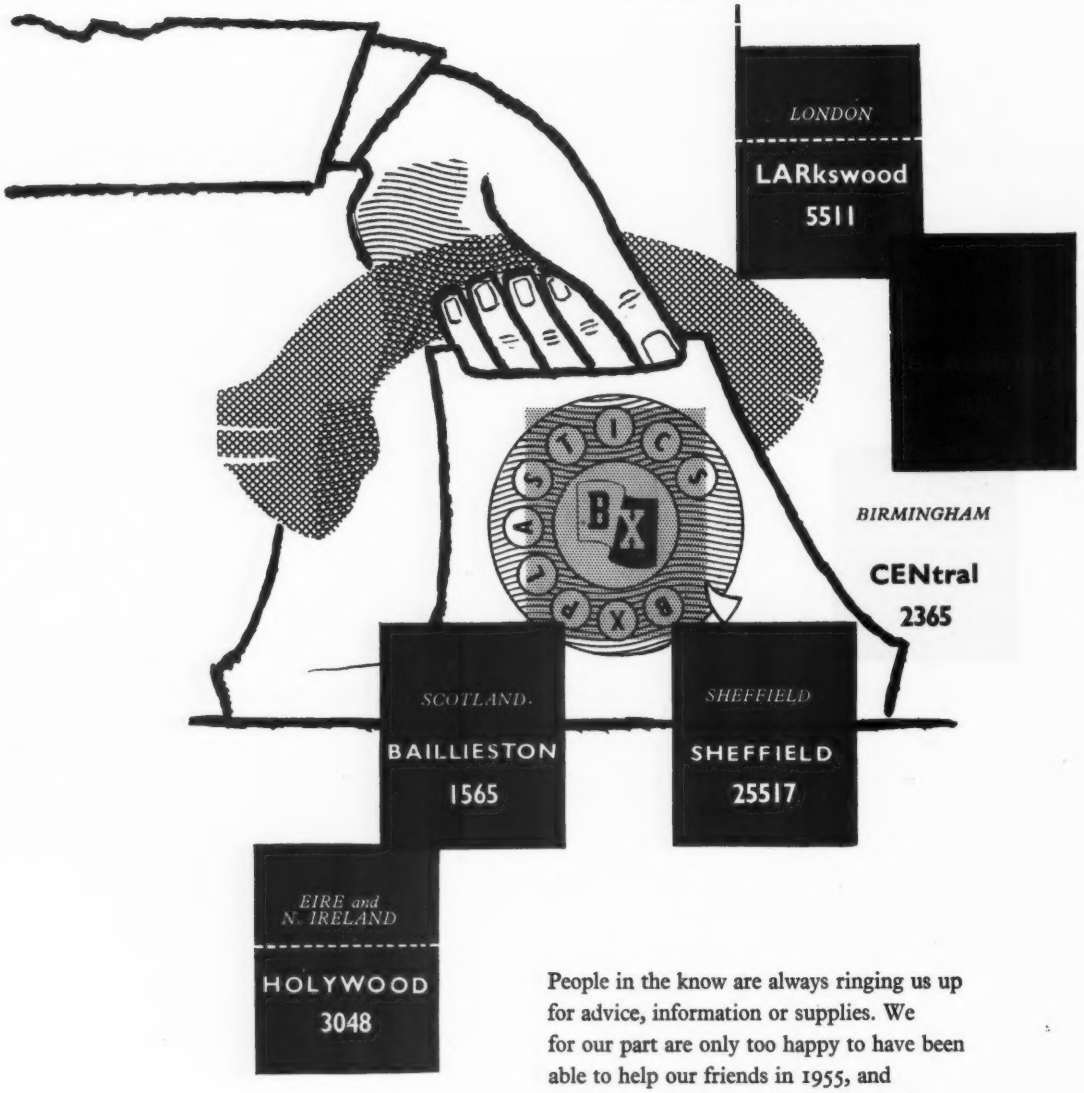
Against a background of enterprise and experience, new or improved materials are continually being evolved by Bakelite Limited for the manufacture of better plastics in industry and the home. Fundamental research into the nature of plastics is a vital part of the development programme.

BAKELITE
VYBAK • WARERITE
REGD. TRADE MARKS
PLASTICS

for anything

in thermoplastics . . .

PHONE BX



People in the know are always ringing us up for advice, information or supplies. We for our part are only too happy to have been able to help our friends in 1955, and look forward to hearing from them again—and from those who haven't got around to dialling us yet—in 1956.

BX PLASTICS LIMITED · HEAD SALES OFFICE · HIGHAM STATION AVENUE · LONDON E.4

T.A.5779

"Couldn't the plastics people solve it?"

It's amazing the things you can do —
the problems you can solve — with plastics today.
Fraser and Glass are the people to help you. A light, tough plastic moulding from Fraser and Glass can cut your costs, increase efficiency and help to make a product more attractive, easier to sell. Yes, Fraser and Glass have all the manufacturing ability you need; the knowledge to pick the type of plastic best suited for your problem; the experience (over 30 years of it) to ensure a successful job. If plastics can help, Fraser and Glass are the people to tell you.

FRASER and GLASS
the plastics people

FRASER AND GLASS LTD · WOODSIDE LANE · LONDON N.12 · HILLSIDE 2224-5

A

and NOW

MODIFIED POLYTHENE

and

IMPACT STYRENE

produced by

R. H. C. RECLAMATIONS

to meet the New Demands of the Toy Trade

Just a Reminder — our reclaimed

POLYTHENE
POLYSTYRENE
CELLULOSE ACETATE

are available in bulk quantities to cost-conscious buyers in all industries

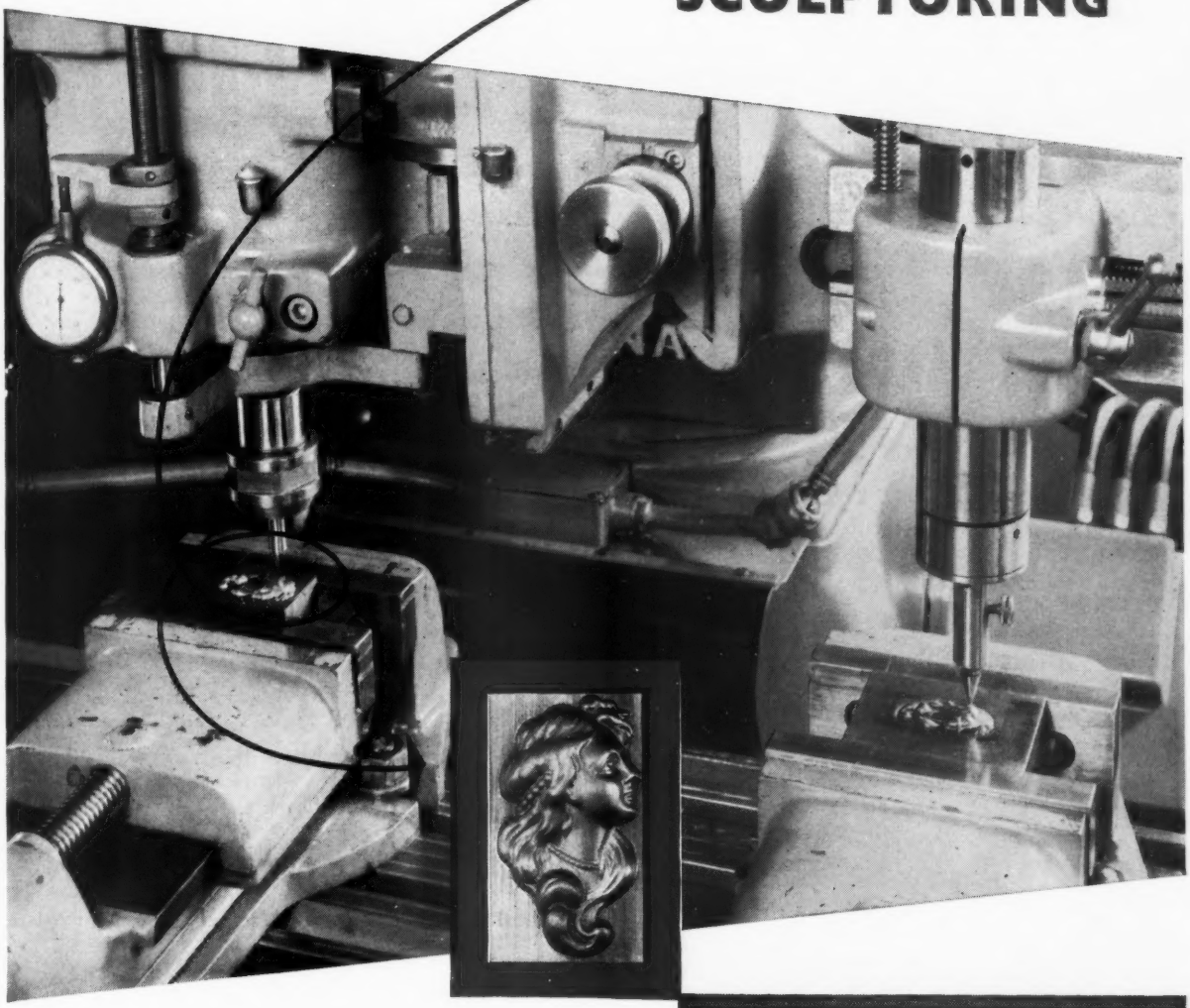
R. H. COLE & COMPANY LTD

2 CAXTON STREET · WESTMINSTER · LONDON · SWI

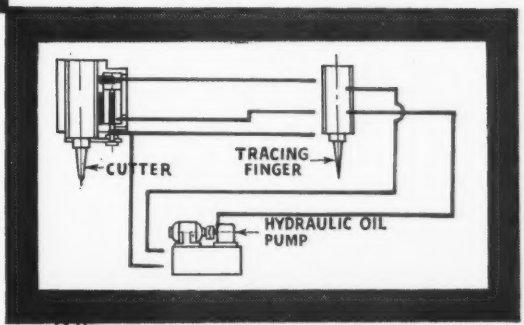
Telephone : ABBey 3061 (10 lines)

Telegrams : GERATOLE, PHONE, LONDON

AUTOMATIC SCULPTURING



Sculpturing is slow, tedious work and a slight miscue can spoil weeks of painstaking labour. "Sculptors" of metal—diesinkers—can employ automatic tracing to produce minute details much faster and more accurately than could ever be done manually. **Cincinnati Tool and Die Millers** are equipped for the economic production of moulds, hobs and dies up to an area of 8″ × 18″ and they can also be fitted with duplex power-driven rotary tables, for making circular moulds. Catalogue M-1731-E will tell you more; why not send for a copy — NOW?



CINCINNATI BIRMINGHAM ENGLAND

Catalogues available from Charles Churchill & Co.'s offices in London, Birmingham, Manchester, Newcastle-on-Tyne and Glasgow or — from Cincinnati Milling Machines Ltd., Birmingham 24.

All New HPM

THE WORLD'S *MOST COMPLETE LINE* OF PLASTICS INJECTION MACHINES!

STANDARD INJECTION MACHINES				
MODEL NUMBER	150-H-6	300-H-12	400-H-20	800-H-48
Capacity (oz.–Single Feed)	6	12	20	48
Capacity (oz.–Double Feed)	8	16	28	64
Material Injected (cu. in. per min.)	440	1035	1330	2895
Plasticizing Capacity (lbs. per hour)	60	100	135	350
Mould Clamp Capacity (tons)	150	300	400	800
Mould Space (hor. × vert.):				
(*a*) Full Platen Vert.	10½″ × 25″	16½″ × 33″	20½″ × 42″	36″ × 54″
(*b*) Full Platen Hor.	20½″ × 15″	30″ × 20″	36″ × 26½″	54″ × 36″
Daylight Opening without Ram Spacer	20″	30″	40″	55″
Daylight Opening with Ram Spacer	16″	26″	34″	47″
Mould Thickness without Ram Spacer	10″	10″	15″	20″
Mould Thickness with Ram Spacer	6″	6″	9″	12″
Clamp Travel (max.)	10″	20″	25″	35″
Motor Horse-power	20	40	50	100
Shipping Weight (pounds)	14500	22000	39000	75000

NOTE: All ratings based on moulding general purpose polystyrene

Other H.P.M. Models are available with these capacities:—

STANDARD
Model 600-H-32 Capacity 32 ounces.
„ 1200-H-80 „ 80/100 „

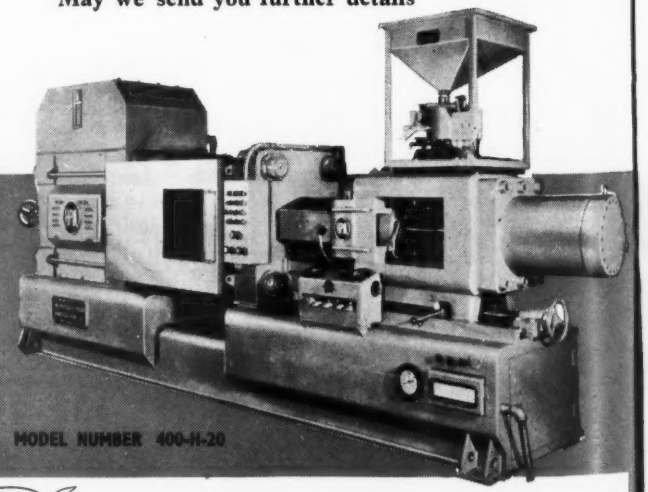
PRE-PLASTICIZING
Model 400-P48A Capacity 48 ounces.
„ 1200-P200 „ 200 „
„ 3000-P400A „ 400 „

From 6 ounces to 400 ounces; with mould clamping pressures from 150 tons to 3,000 tons . . . that's the scope of the new H.P.M. range.

Each machine is new, designed with many outstanding features. High capacity plasticizing chambers, weigh feeders, greater 'shot' capacities, increased daylight and stroke, quiet pumps, and sub-plate mounted valves reducing piping to the absolute minimum, are some of the reasons why H.P.M.'s mould better, faster and at lower cost.

They are famous for dependability too; designed by America's pioneer manufacturers of injection machines, each unit has 77 years' hydraulic machinery building experience behind it.

May we send you further details



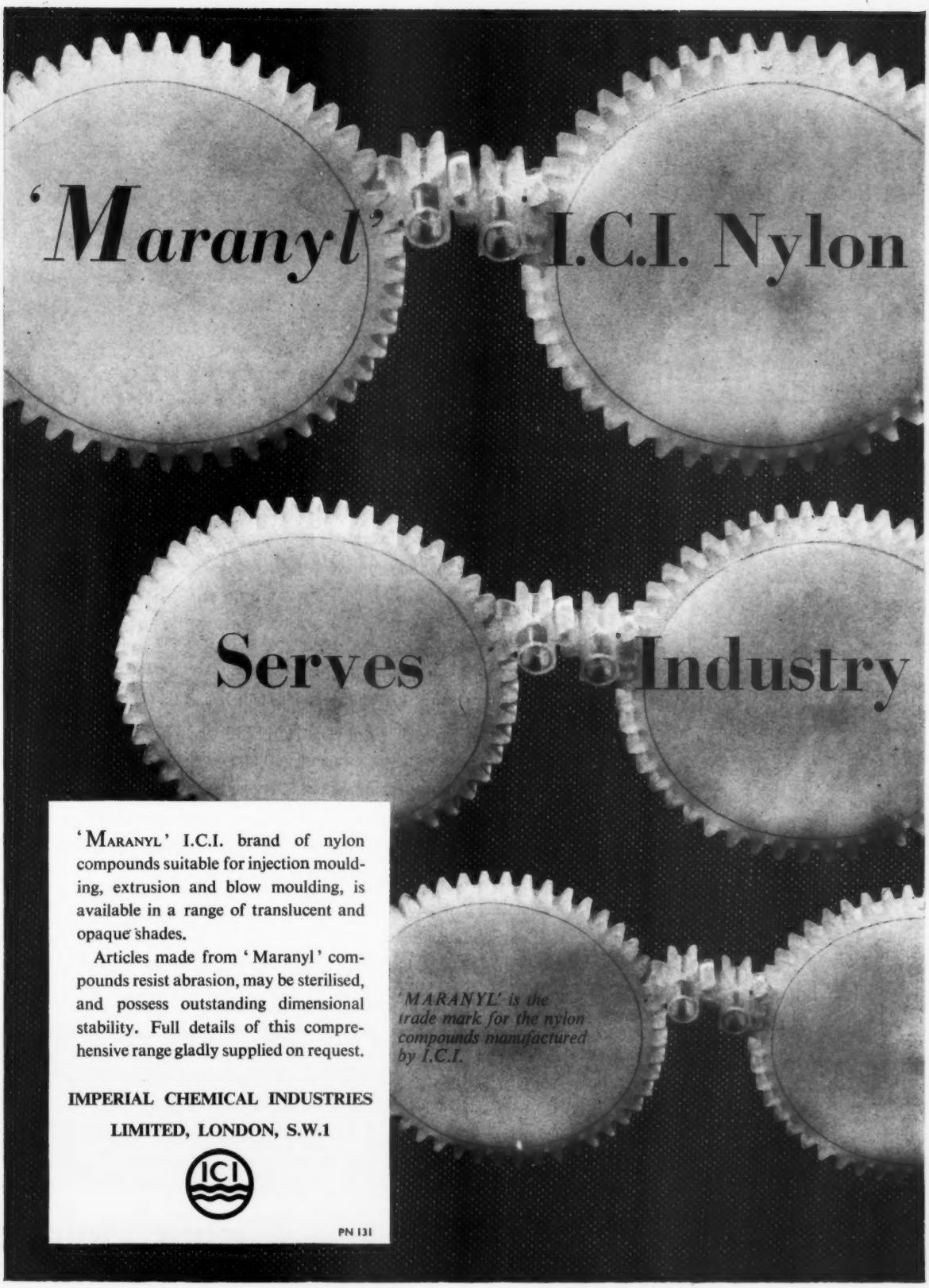
MODEL NUMBER 400-H-20

WICKMAN LIMITED

FACTORED MACHINE DIVISION, FLETCHAMSTEAD HIGHWAY, COVENTRY

Telephone: Coventry 40351

40 P5



'MARANYL' I.C.I. brand of nylon compounds suitable for injection moulding, extrusion and blow moulding, is available in a range of translucent and opaque shades.

Articles made from 'Maranyl' compounds resist abrasion, may be sterilised, and possess outstanding dimensional stability. Full details of this comprehensive range gladly supplied on request.

'MARANYL' is the trade mark for the nylon compounds manufactured by I.C.I.

IMPERIAL CHEMICAL INDUSTRIES LIMITED, LONDON, S.W.1

ICI

PN 131

how to put your finger on 20% higher production

Consistency
The auto-control moulding cycle ensures a product of uniform excellence, because once the sequence is pre-set it never varies.

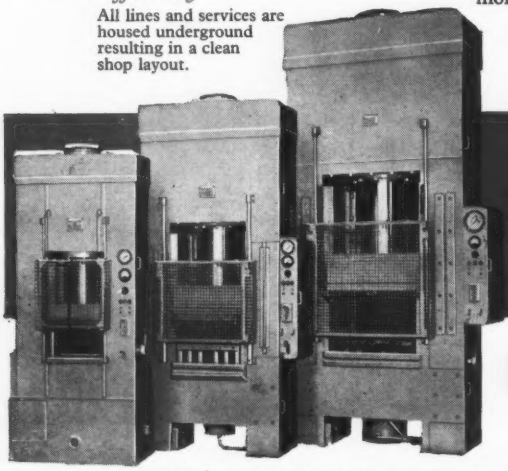
Economy
Semi-skilled labour and female labour can be used. One operator can often work more than one press at a time, according to the nature of the job.

Productivity
Unvarying, pre-set sequences ensure that the maximum number of lifts at correct cure is attainable. The reject rate is always drastically reduced, especially on complicated jobs.

Efficiency
All lines and services are housed underground resulting in a clean shop layout.

Install BIPEL presses and, say users, up goes the production rate; indeed an increase of 20% represents an approximate average and even more impressive results are often obtained. It is only logical that this should occur, for BIPEL auto-control moulding takes the operation out of the hands of hit-and-miss human judgement, ensuring a precise, uniform sequence, a uniform standard in the moulded product. *UP* goes production, for auto-control ensures the attainment of the maximum number of lifts: *DOWN* goes the reject rate to negligible proportions when auto-control comes into play. Over 100 BIPEL installations are now at work producing more mouldings of all kinds, particularly complicated mouldings more accurately, more efficiently, more economically.

Send for descriptive literature of BIPEL hydraulic Presses and their companion machines, BIPEL hydraulic Pelleters.



THREE TYPES AVAILABLE

With three models, Types 40, 100 and 200, BIPEL Compression and Transfer Presses offer together a range of variable pressures from 20 tons to 300 tons. BIPEL Auto-control Double-acting Side Ram Presses and Low Pressure Presses for Structural moulding also available.

B·I·P

BIPEL *auto-control* **PRESSES** *and* **PELLETERS**

B.I.P. Engineering Ltd., Streetly Works,
Sutton Coldfield

BIPEL is a registered Trade Mark, Patents granted or pending

the moulding shop at

Kleestron

DEALS IN BOTTLE NECKS

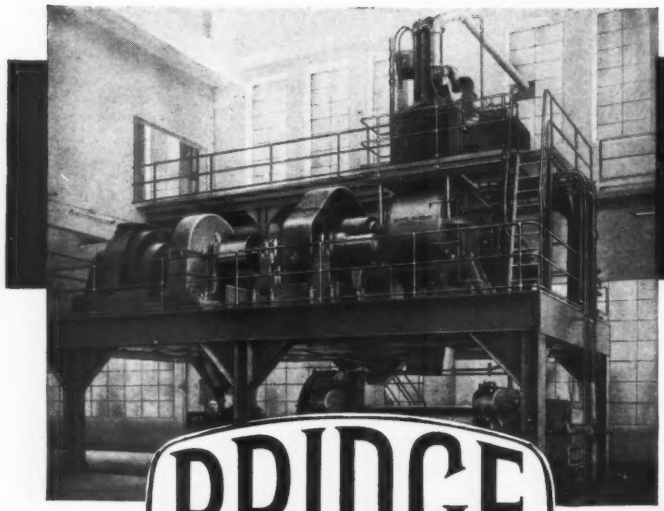
Or rather it deals *with* them.
For here, sample batches of Kleestron polystyrenes are moulded into articles as a final test.
These try-outs give Kleestron moulding men the opportunity of discovering and eliminating anything likely to cause rejects or hold-ups in actual production.
In this way Kleestron H.469, for one, has been proved ideally suitable for automatic moulding operations. Smooth flow is assured. Automation becomes practicable, for Kleestron polystyrenes have their troubles ironed out beforehand.
It all adds up to service in a big way —you can rely on that when you're dealing with *Kleestron*.

Kleestron

Manufacturers of:—

Kleestron H.469 — high impact polystyrene in extruded or dry colourant pellets
Kleestron Crystal 694 — dry colourant blend
Kleestron Crystal 467 — extruded pellets
Kleestron DS — destaticized polystyrene
Kleestron Standard Colour Range — samples on request
Kleestron Special Colour Matchings — 48-hour service

KLEESTRON LIMITED · West Halkin House · West Halkin Street · London · SW1 · 'Phone: SLOane 0866



BRIDGE

dard for
efficiency compo

CALENDERS of all Types and for all purposes. Superimposed, Inverted "L", "Z", or Triangular.

now available

BAKELITE TRADE MARK polyethylene

in four grades

Resilience, flexibility, lightness, high impact strength, wide colour range—these are some of the characteristics of POLYETHYLENE. This versatile material is suitable for the manufacture of a wide range of products: flexible piping, packaging film, unbreakable bottles and containers, etc.

BAKELITE POLYETHYLENE RESIN DYNH

This is a general purpose resin which can be used for injection moulding, pipe, and electrical applications. Average molecular weight :—21,000.

BAKELITE POLYETHYLENE COMPOUND DE-2400

A hot homogenised DYNH with excellent extrusion characteristics and freedom from fish eyes. Designed for unsupported thin film extrusion and high quality injection moulding.

BAKELITE POLYETHYLENE RESIN DYNF

Specifically recommended for injection moulding, and for extrusion work where a softer grade than DYNH is required. Average molecular weight :—19,000.

BAKELITE POLYETHYLENE COMPOUND DE-2300

A hot homogenised DYNF with good extrusion characteristics and freedom from fish eyes. Recommended for extrusion lamination process, and injection moulding.

Please contact Bakelite Limited for full details of the advantages and uses of these materials.

BAKELITE LIMITED

12-18 GROSVENOR GARDENS · LONDON SW1 · Telephone: SLOANE 0898

Bakelite Polyester Resins · Bakelite Phenolic & Urea Resins, Cements & Adhesives · Bakelite Phenolic, Urea, Alkyd & Silicone Moulding Materials · Bakelite Laminated Sheet, Rod & Tube · Bakelite Glass Fibre & Asbestos Laminates · Vybak PVC Moulding & Extrusion Compounds · Vybak Rigid & Flexible PVC Sheet · Warerite Decorative Laminated Plastics.

TSA 01

società
riunite
celluloide
mazzucchelli
castiglione olona
(varese) italy

stirol

for colour and easy mould

walter ballmer VSG

S.I.C. Plastics Ltd. (Sole U.K. Concessionaires for Soc. Italiana Celluloide)
12 Whitehall, London, S.W.1 *Telephone:* Trafalgar 7337

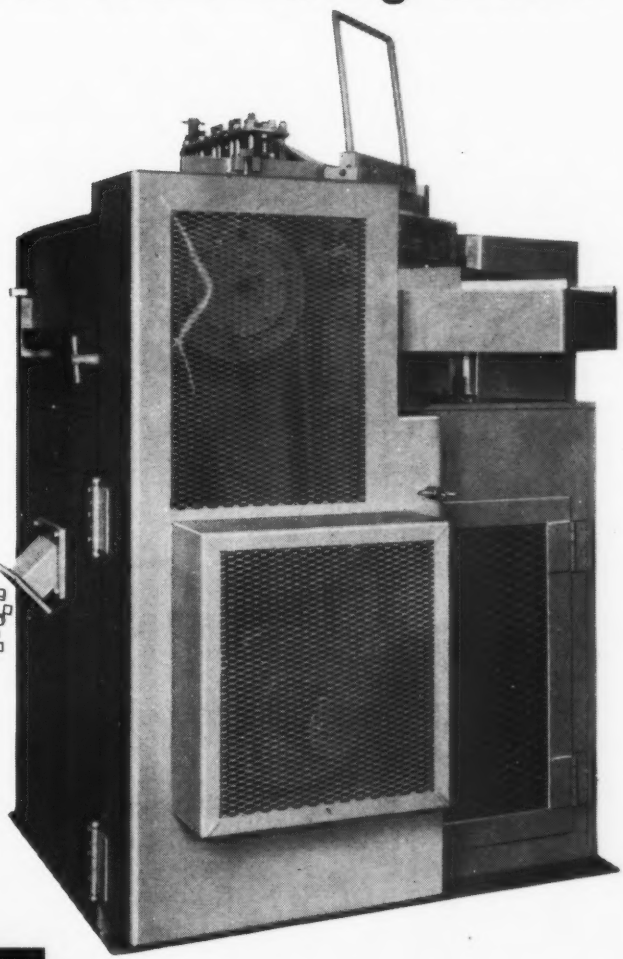
PERFECT CUBES *(NO LONGS)*

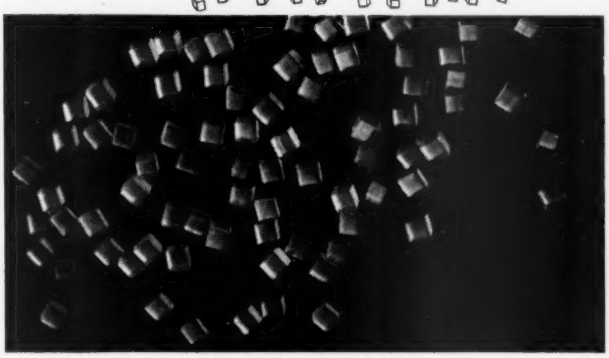
Cut from sheet stock in one shearing action

THE BURTONWOOD CUMBERLAND "STAIR-STEP" DICING MACHINE

Burtonwood-Cumberland "Stair-Step" Dicing Machine offers you a completely new method of dicing plastic materials. Perfect cubes, free from longs, are cut from sheet stock in one shearing action! All sides of the cube are cut cleanly. Cubes or rectangular pellets may be produced in various sizes ($\frac{1}{16}$ in. to $\frac{1}{2}$ in.) by simply changing knives.

This new dicing principle makes it possible to dice the full range of plastic materials, including polyethylene, vinyl, acetate and nylon. Two standard machine sizes accommodate sheets up to 7 ins. or 14 ins. wide. Machines to handle greater widths can be specially built. Write for complete technical details.





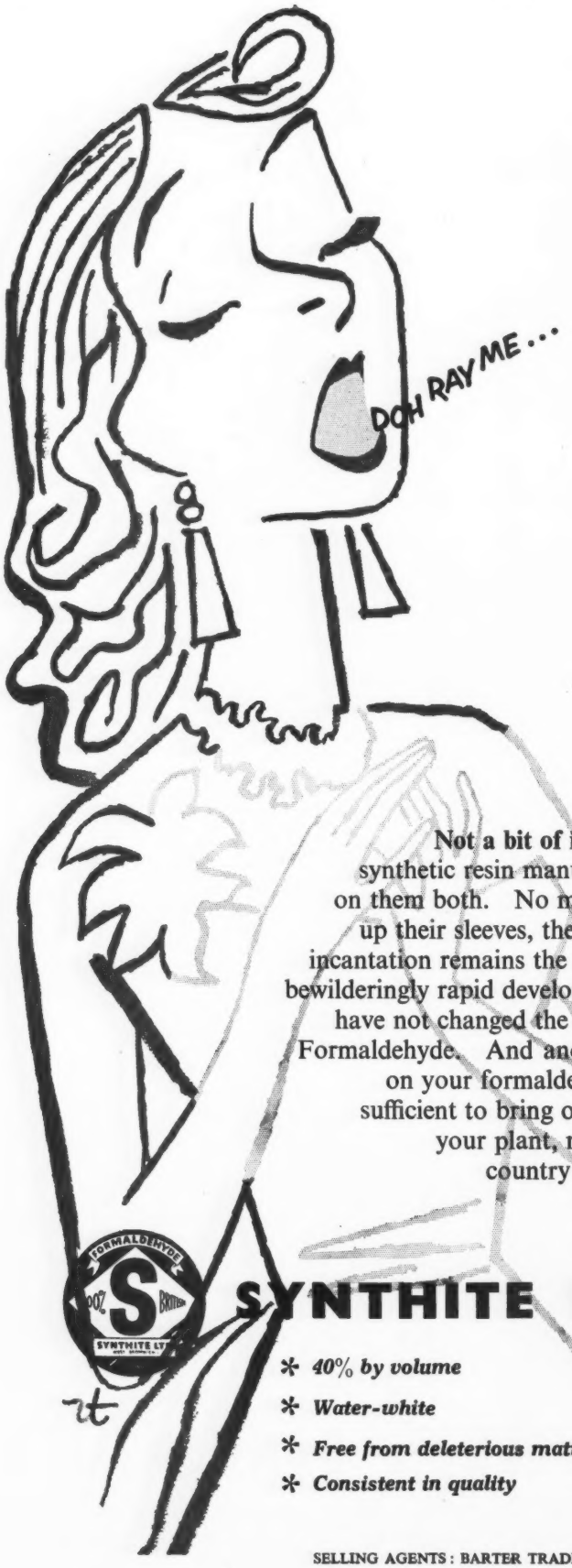
We are specialist manufacturers of extrusion screws and liners of all types. Our services include:—

- **Design and manufacture of special screws.**
- **Replacement screws and liners.**
- **The overhaul and redesign of extruding equipment.**

Manufactured under licence from Cumberland Engineering Company, Inc., United States

BURTONWOOD ENGINEERING COMPANY LTD

Head Office & Works: BURTONWOOD, WARRINGTON, LANCASHIRE. Phone: Newton-le-Willows 3311 (10 lines)
London Office & Works: EDGWARE ROAD, THE HYDE, LONDON, N.W.9. Phone: Colindale 4661 (7 lines)



Bit of a far cry from the tonic solfa to Synthite Formaldehyde,

Isn't it?

Not a bit of it! Whether you're a soprano or a synthetic resin manufacturer you can always rely on them both. No matter what the modern composers have up their sleeves, the familiar "doh, ray, me, fah" incantation remains the same. Similarly, thirty years of bewilderingly rapid development in the synthetic resin industry have not changed the constant uniformity of Synthite Formaldehyde. And another thing: you can always rely implicitly on your formaldehyde deliveries. A telephone call is sufficient to bring our fast tankers speeding towards your plant, no matter what part of the country it may be.

SYNTHITE FORMALDEHYDE

* *40% by volume*
* *Water-white*
* *Free from deleterious matter*
* *Consistent in quality*

SYNTHITE LTD., WEST BROMWICH, STAFFS.

BRITAIN'S LARGEST MANUFACTURERS OF FORMALDEHYDE

A member of the Tennant Group of Companies

SELLING AGENTS: BARTER TRADING CORPORATION, 14 WATERLOO PLACE, LONDON, S.W.1

'924'

SEMI-AUTOMATIC PRESS for compression moulding

This semi-automatic press is one of a range of machines which has been developed to meet the needs of manufacturers who want a press with its own pump unit, and only requiring the electrical connections to be made for starting up.

The press has a number of outstanding features, a few of which call for special mention.

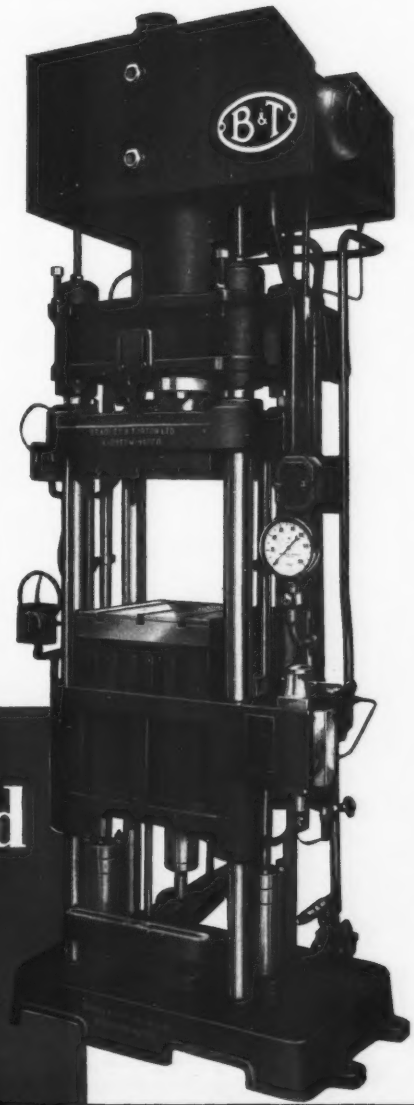
The working pressure is easily adjustable between the maximum and minimum loads stated in the specification.

All movements of the press are controlled by a single lever control valve.

The press has a fast approach and return speed, but automatically changes over to slow speed for the actual opening and closing of the mould. The point of change-over is easily adjustable to operate at any position of the stroke of the press.

The illustration shows the press fitted with electrically heated platens.

Also manufacturers of : Auto-Control Presses • Pelleting Presses Hydraulic Pumps • Hydraulic Accumulators • Hydraulic Valves Automatic Moulding Cycle Control Units.



Bradley & Turton Ltd

CALDWALL WORKS, KIDDERMINSTER

THE LEADING MANUFACTURERS OF COMPRESSION MOULDING EQUIPMENT

Current Beecham Achievements

"... let us say how very much we appreciate the fact that you have completed our new Metal Finishing Department by the scheduled date, in spite of the appalling weather conditions which confronted your erection gangs last winter. ... the finished structure is light and airy, and has removed the terrible bogy of corrosion which has worried us for years Throughout the whole of our factory the fumes from the Anodising Plant have adversely affected the steelwork—necessitating constant painting. Now, thanks to you, we have installed the plant in a corrosion-proof building, which requires no painting or maintenance, and our Directors feel that we are very greatly indebted to you for your assistance."

Quoted from a letter written by a Director of Messrs. Haynes, Ford & Elliott Ltd.

... completed to schedule this factory illustrates another successful Beecham contract, undertaken during a period of maximum production and against adverse weather conditions.

Concurrently Beecham Buildings have erected the largest prefabricated industrial building in this country: a 200,000 sq. ft. factory in the Midlands. Their *new ways of building* allow Beecham to keep the pace on all their numerous contracts; with technical efficiency and well studied economy Beecham Buildings satisfy the needs of expanding Industry.

May we advise you on your industrial building programme?

BEECHAM BUILDINGS LIMITED

DEPARTMENT K

SHIPSTON-ON-STOUR WARWICKSHIRE Phone: Shipston-on-Stour 315, 316 & 328

Beecham Buildings

AP211/48

STERNITE

Phenolic Moulding Powder

FOR COMPRESSION & TRANSFER MOULDING

General purpose Grades: (Types G and GX) conforming to B.S.S. 771

All of exceptional quality for their particular applications and in a range from which it is possible to meet any specification with absolute confidence.

Other Grades available include:

Shock resisting	Heat resisting
Water resisting	Acid resisting
High dielectric	Cabinet
Telephone Grade 1	Odourless, etc. etc.

IT'S PART OF *Sterling* SERVICE

"Pour it down the telephone"—catch phrase with Sterling for supplies that are required urgently. When we put "P.D.T." on a customer's order, the staff knows what it means. We pride ourselves that our customers get what they want, when they want it and at the keenest price.

All other things being equal, a customer goes to the supplier who gives the closest attention to his individual requirements. The "other things" of course are of vital importance—quality, consistency and technical service.

STERNITE moulding powders are used by the leading moulders in this country and overseas. May we have the opportunity of meeting *your* requirements "P.D.T."?

Member THE BRITISH PLASTICS FEDERATION

Sterling Moulding Materials Ltd.

STERLING HOUSE, HEDDON STREET, LONDON, W.1. *Works: Stalybridge, Cheshire.*

Phone: Grosvenor 5301/10. Grams: Stermold, Piccy, London. Cables: Stermold, London.

S.13a

CRAYMAC offers a galaxy of new designs in P.V.C. sheeting for Rainwear Fashion 1956

Serial No ★ 1923
BRITISH
GOOD HOUSEKEEPING INSTITUTE
GUARANTEES
REFUND OF MONEY OR REPLACEMENT IF NOT IN CONFORMITY WITH THE INSTITUTE'S STANDARDS

Take a good look at this piece of plastic sheeting. Feel it, handle it. It's one of the brilliant new designs in Craymac printed and textured plastic sheeting, that will give the plastic rainwear manufacturer unprecedented opportunities to create really exciting looking fashions . . . rainwear with real eye appeal.

Craymac textured effects are permanent and the printed colours become part of the fabric and cannot wear off. Craymac is manufactured to British Standards Institution Specification No. 1763.

SNOWFLAKE
An entirely new printed design with strong fashion appeal available in many textured effects in 9 colour ways.

FIREWORK
An exciting and very original design that makes fashion news. Also in 9 colour ways.

TWIG
Gay new printed design that is already in great demand. In 9 colour ways.

GREENWICH PLASTICS LTD

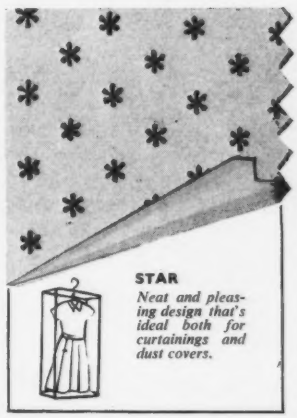
A Greenwich PRODUCT

Write for pattern folders to:
GREENWICH PLASTICS LTD.
ST. MARY CRAY, KENT, ENGLAND
Tel. Ravensbourne 4674/5 and Orpington 25671/2/3

CRAYMAC gives a new appeal to plastic curtainings and fancy goods

SNOWFLAKE
Exciting new printed design available in many textured effects. Ideal for pinarettes.

TWIG
Another printed design from the new range, for toilet bags and other fancy goods.



STAR
Neat and pleasing design that's ideal both for curtainings and dust covers.

Craymac P.V.C. sheeting, with its fresh and colourful printed and textured effects that are permanent, is in lively demand for curtainings and fancy goods, pinarettes and the like. Designs for these include the new Snowflake and Twig, and many charming florals and spot designs. Craymac is strong, flexible and crease resistant, and the range includes both translucent and opaque sheeting, in a variety of thicknesses.

GREENWICH PLASTICS LTD

ST. MARY CRAY, KENT, ENGLAND. Tel. Ravensbourne 4674/5 and Orpington 25671/2/3

CLEMATIS
Gay novelty and floral design that would brighten any room. In several colour ways and textured effects.

GREENWICH PLASTICS IN INDUSTRY

Greenwich make a range of plastic materials for many industrial uses, including protective clothing for outdoor and industrial workers, and for packaging.

FOR PROTECTIVE CLOTHING

CRAYTEX P.V.C. coated fabric for industrial clothing, rain capes and rainproof coats in a variety of weights and grades.

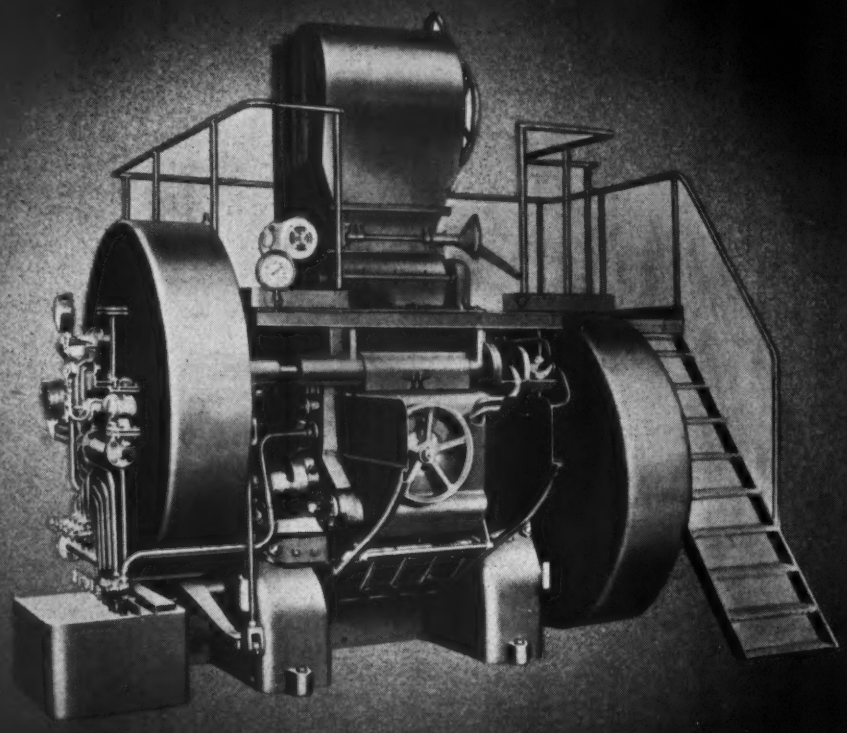
CRAYTEX Fleecy Back P.V.C. coated fabric for windjammers, golf jackets and motor cycling suits. Needs no lining.

FOR PACKAGING

CRAYLENE vinyl packaging film for protection of goods against dust and damp. In rolls or made up to specification.

A Greenwich PRODUCT

For RUBBER or PLASTICS...



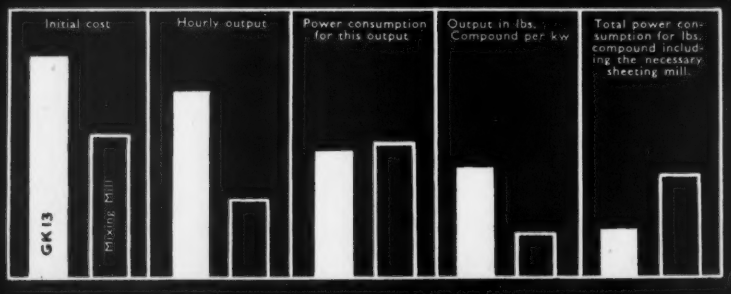
AUTOMATIC INTERNAL MIXERS

(WITHOUT FLOATING WEIGHT)

Used extensively throughout the world these Mixers without floating weight are indispensable for small batch production or special compounds in the larger Plants and small Factories alike. Their low cost, excellent mixing properties and unique "SPLIT CONSTRUCTION" have made these Mixers a continued attraction for many years.

Great advantages can be gained when these Mixers are employed instead of conventional mills in both the Rubber or Plastics Industries, as shown on the chart (right) which compares a Mixer with a Mill of similar working capacity.

Please ask for illustrated brochure giving further particulars.


Initial cost
Hourly output
Power consumption for this output
Output in lbs. Compound per kw
Total power consumption for lbs. compound including the necessary sheeting mill.
GK 13
Mixing Mill

Manufactured by **WERNER & PFLEIDERER** *to those standards of Design, Construction and Workmanship which have been their tradition for many years.*

JOHN KIMBELL & CO., LTD. (RUBBER & PLASTICS DIVISION)

Consult

146 GROSVENOR ROAD · WESTMINSTER · LONDON · S.W.1

Telephones: TATE GALLERY 8288 *Telegrams:* JONKIMBELL, SOWEST, LONDON

By the time this plaice gets home . . .

. . . it will have been in the shopping basket for over two hours. But the customer need have no fear of it coming through the wrapping and impregnating the rest of the shopping.

Far from becoming a soggy mess, this parcel will stay firm and intact—the reason being that the fish is wrapped in paper treated with Melamine resins. Highly hygienic, paper treated with Melamine resins retains fully half its dry strength when wet.

Not only for wrapping—but for paper towels, carrier bags, laundry tags, photographic printing paper, maps and many other purposes, paper treated with Melamine resins is the best available today.

British Oxygen Chemicals make only the *chemical* Melamine; names and addresses of manufacturers of Melamine resins and moulding powders will be supplied with pleasure. Please write for further information to:—

British Oxygen Chemicals Limited,
Vigo Lane, Chester-le-Street, Co. Durham.
Tel: Birtley 145.
London Office: Bridgewater House,
St. James's, London, S.W.1.
Tel: Whitehall 9777.

Forty years' experience in moulded plastics. That's the G.E.C. record in a still young and expanding industry. Planning and producing insulating components and moulded parts for a wide range of industrial and domestic products, the G.E.C. can place at your disposal mass production facilities backed by the intensive study of plastics, from the research laboratory right through to the finished article.

This refrigerator tray in Polystyrene material is a typical example of the large variety of mouldings made by the G.E.C.

moulded plastics for industry

THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2.

More than a Machinist . . .

The number of men who can operate precision toolroom machines must run into many thousands. This man is one of them, but he is a machinist with a difference—for he is one of the Craftsmen of Tyburn Road; the most exacting standards are expected of him and he can satisfy those standards only because, in addition to operating skill, he has behind him an intimate knowledge of the art of mould-making, acquired during many years' continuous service.

To endeavour to build a tradition in a young industry during uncertain times is, indeed, a formidable task. Yet that is what has been achieved and will always remain the cornerstone of this model Toolmaking Unit. Stringent standards, careful selection and training of staff, and, especially, those working conditions which ensure continuity of service—these are all reflected in the precision and perfection of finish of every tool made by . . .

B·I·P

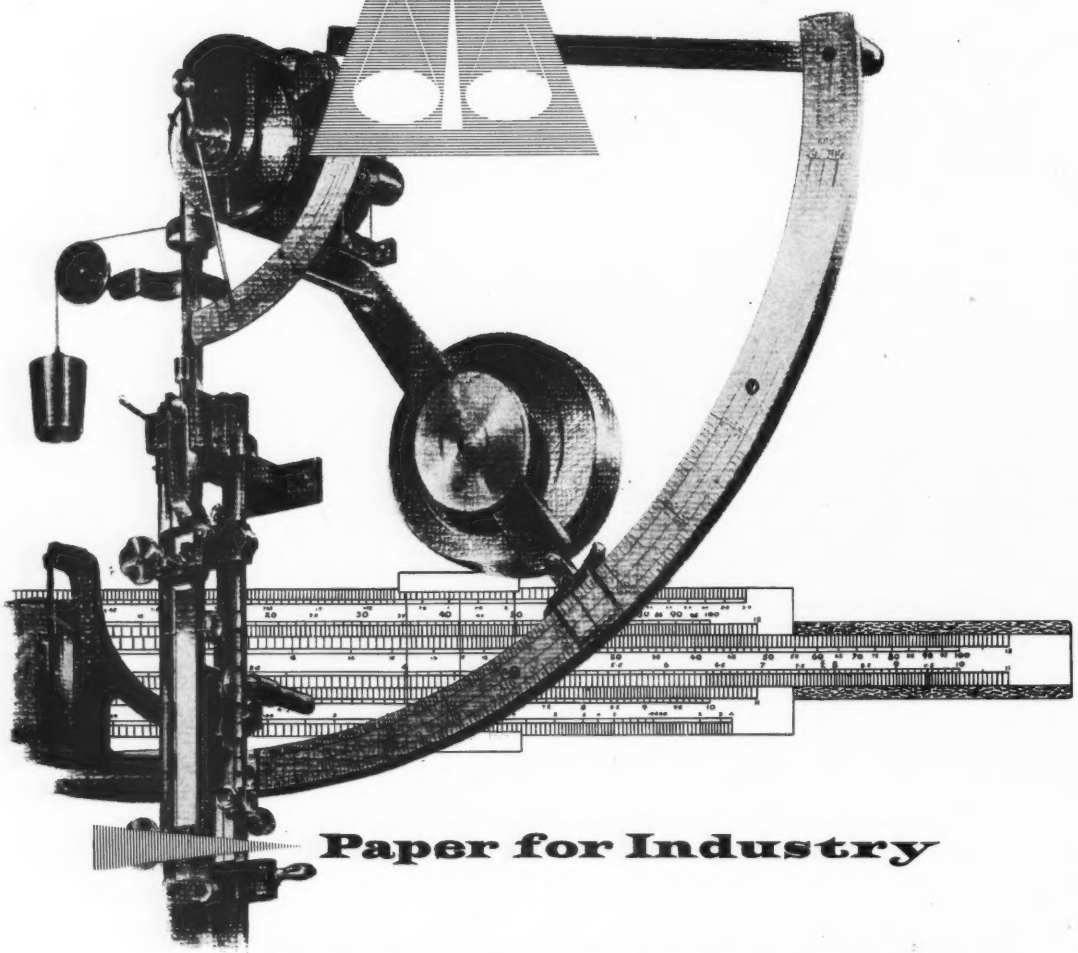
THE CRAFTSMEN OF TYBURN ROAD

B·I·P TOOLS LTD

Tyburn Road · Erdington · Birmingham 24 · *Phone:* Birmingham East 2061 · *Grams:* Plasmould Birmingham 24

MEMBER OF THE GAUGE AND TOOL MAKERS' ASSOCIATION

control



Paper for Industry

Papermaking is not yet a precise science, and as a compromise between conflicting requirements in paper has often to be made, it is only by very careful scientific control that the final specification can be met. The Wiggins Teape Group is well equipped with the most up-to-date control methods and in addition has nearly 200 years of papermaking know-how and experience. New industrial uses for paper cover a large part of the Research programme of the Group.

Wiggins Teape
FINE PAPER MAKERS
LONDON
1761

THE WIGGINS TEAPE GROUP

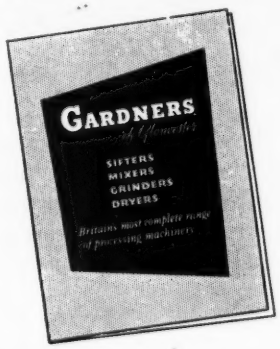
46-58 MANSELL STREET, LONDON, E.1 ROYAL 7210

If you have to

GRIND IT . . . SIFT IT,

MIX IT . . . . or DRY IT . . . .

talk to GARDNERS of Gloucester



This attractive new folder describes 22 types of Gardner sifting, mixing, drying and grinding machines. Send for your copy today.

It might be a standard Gardner grinder, mixer, sifter or dryer. You have Britain's widest range of machines to choose from. Or it might need some special features to suit your process. It might even have to be a special job entirely. But you'll get the right machine from Gardners of Gloucester. Send in sample materials for a confidential test report and recommendations on the right machine for the job. It's the *quickest*, surest way to solve a processing problem.

GARDNERS *of Gloucester*

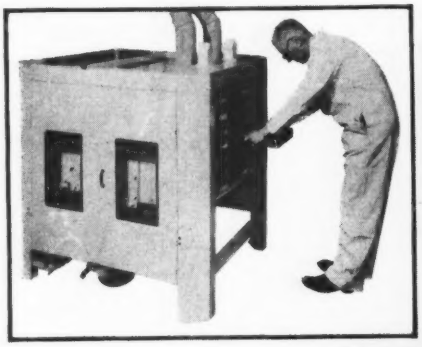
Wm. GARDNER & SONS (GLOUCESTER) LTD., BRISTOL ROAD, GLOUCESTER

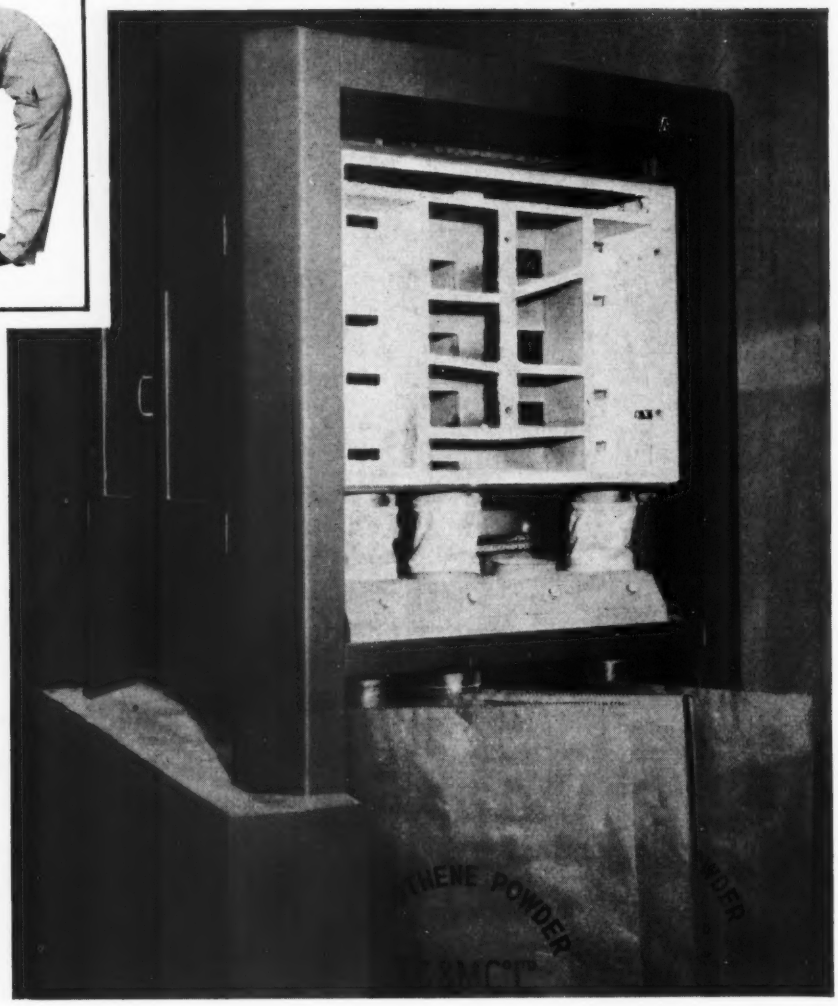
(A subsidiary of the Gloucester Railway Carriage & Wagon Co. Ltd.)

Telephone: Gloucester 21261 *Telegrams & Cables: 'Gardner, Gloucester'*

London Office: 1 ALBEMARLE STREET, LONDON, W.1 *Telephone: Grosvenor 8206*

SIMPLIFIED, HIGH SPEED SIFTING OF MOULDING POWDERS with the Simon Junior Sifter





This Junior Sifter, installed at T. C. & M. Co. Ltd., has the side cover removed to show the internal sieving arrangement.

For trouble-free sifting of moulding powders, the Simon Junior Sifter will take a lot of beating. Big names in the plastics industry including Telegraph Construction and Maintenance Co. Ltd., find that Junior Sifters are ideal machines for high-capacity screening, grading and sifting.

The powerful rotary motion of the horizontal sieves gives positive separation with absolutely dust-free operation. Junior Sifters can be fitted with mechanical feeders or they can be incorporated into your existing processing system. Let us talk to you now about your sifting problems.

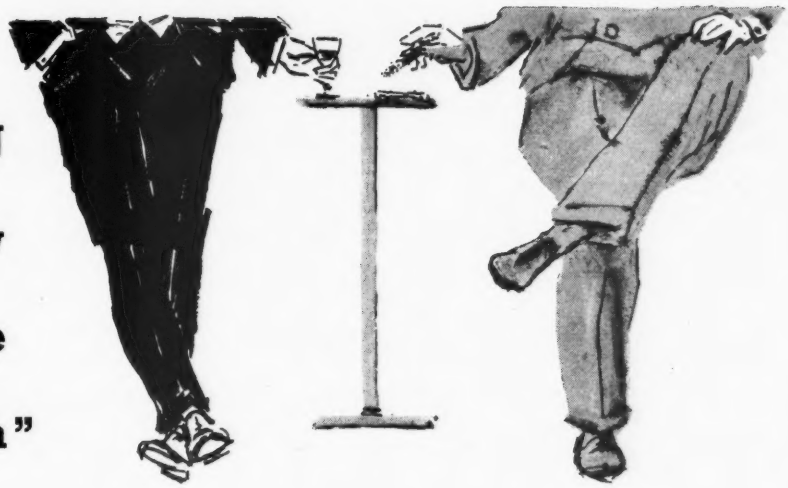
Industrial plant by ***Henry Simon Ltd*** SIMON ENGINEERING GROUP

STOCKPORT, ENGLAND

HS 191

"Have you heard?..

...STYRON is now being made in Britain"



STYRON 666 is now in full production at Barry, Glamorgan. British-made STYRON* is now freely available to all. British Resin Products Ltd. — as the sole selling agents for STYRON POLYSTYRENE — welcome and will deal promptly with all enquiries about STYRON from British production.

Write for booklet 200 for further information

STYRON Polystyrene

IS MANUFACTURED BY DISTRENE LTD AND MARKETED BY BRP

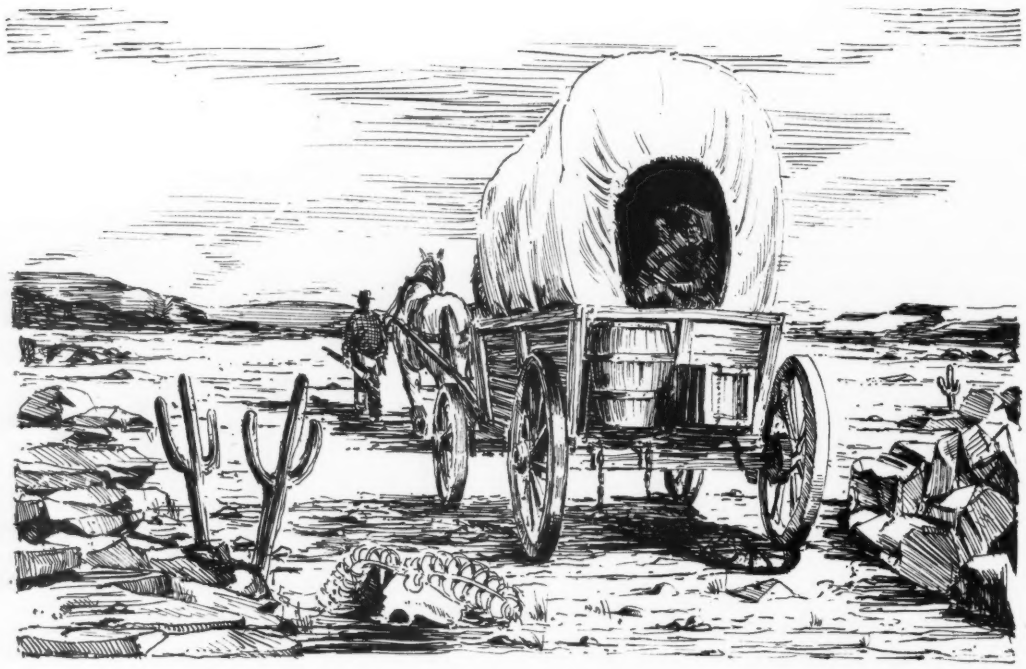
SOLE SELLING AGENTS BRP

* British-made Styron materials are exported under the registered trade name Distrene.

BRITISH RESIN PRODUCTS LIMITED and DISTRENE LIMITED

2 plastics companies in the Distillers Industrial Group

SALES AND TECHNICAL SERVICE: DEVONSHIRE HOUSE · PICCADILLY · LONDON · W1 TELEPHONE: MAYFAIR 8867



PIONEERS

They say the West is pretty well opened up today . . . few places left to discover. Pioneers are out of date.

But in the field of plastics it's a different story. As plastics replace traditional materials new problems of bonding and drying are created — problems which the Spooner organisation is constantly being asked to solve. The outstanding success of Spooner machines for new heat treatments — from setting nylon stockings to fusing heavy conveyor belting — is the outcome of Spooner pioneering.

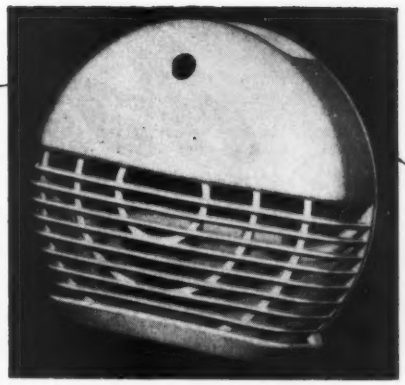
And that's worth remembering next time you have drying problems to solve.

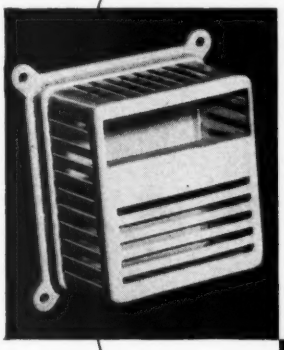
SPOONER
REGISTERED TRADE MARK

THE SPOONER DRYER & ENGINEERING CO. LTD.

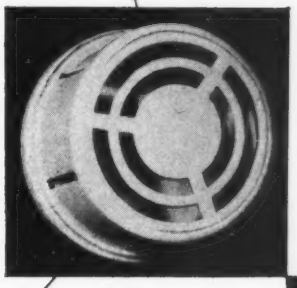
MOORLAND ENGINEERING WORKS, ILKLEY, YORKS, ENGLAND

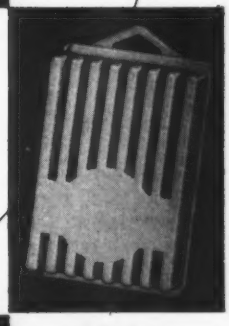
Telephone: ILKLEY 1771 (3 lines) Telegrams: ILKLEY 1771 Cables: SPOONER, ILKLEY, ENGLAND



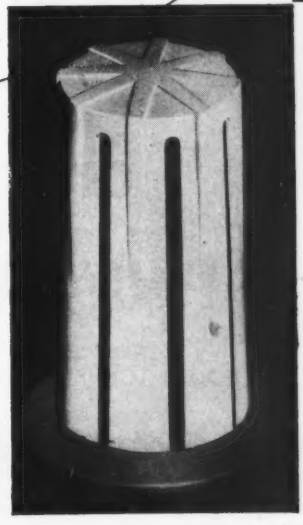


U·M·P PLASTICS





..serve the interests of Hygiene



U·M·P
for Tubes and Plastics

These illustrations show typical examples of U.M.P. SERVICE for one particular Industry.

We are at the service of other Industries requiring expert assistance in design and production of PLASTIC MOULDINGS of all types.

For Glass or Asbestos Fibre Reinforced Plastics, consult our LAMFORTE SECTION.

UNIVERSAL METAL PRODUCTS LTD.
SALFORD 6 LANCS. *Telephone:* PENDLETON 4444
LONDON OFFICE: ARGYLE HOUSE, 29/31. EUSTON ROAD. N.W.1. TEL. TERMINUS 2073

Ask Crystalate to quote for Moulded Plastics

COMPRESSION TRANSFER & INJECTION MOULDINGS INC. NYLON

CRYSTALATE LTD.
ASSOCIATING
MICA PRODUCTS LTD.

ALSO— S R B P TUBES BOBBINS & FORMERS

CRYSTALATE HOUSE, TONBRIDGE, KENT. PHONES TONBRIDGE 2261/5 (25 LINES)

56 years experience at your service

How many problems in a **ROCKET?**

A 'FLEXIBLE' PROBLEM—a Compoflex answer. In this country the higher concentrations of hydrogen peroxide (H.T.P.) may be used, among other things, as propellant oxidants for guided weapons. Because of its unique properties H.T.P. can be a dangerous liquid to handle and, until the Ministry of Supply asked Compoflex to develop one, no perfectly satisfactory and safe method of transporting it by 'flexible' means existed. The Compoflex answer was a range of hoses made of Terylene and a specially-compounded p.v.c. known as Molene.

We offer the only complete Advisory Service on flexible tubing and hose. As suppliers of all types and in all materials, we can recommend 'flexibles' best suited to a particular job, *and at the right price.*

• if there is a 'flexible' answer, you'll find it at

COMPOFLEX

COMPANY LIMITED

Flexible Centres at: 26, Grosvenor Gardens, London, S.W.1. Tel: Sloane 6185/5109 & Huddersfield Road, Oldham, Lancashire. Tel: Oldham-Main 8114. ***BRITAIN'S ONLY FLEXIBLE CENTRES***

FACTORIES AT OLDHAM AND SOUTH WIMBLEDON

G13

Hornflowa

U.F. POWDERS

★

PRESSRITE

The "General Purpose" MOULDING POWDER

Paper-filled, giving excellent physical properties, translucent, fine or densified. Available in 3 grades of flow: fast, medium and stiff. All colours.

★

FLOWRITE

Specially prepared for fine Quality Mouldings

High translucency imparted by special cellulose filler, undensified, any colour matched to order, ideal for buttons, costume jewellery, etc.

★

HORNFLOWA

RESINS

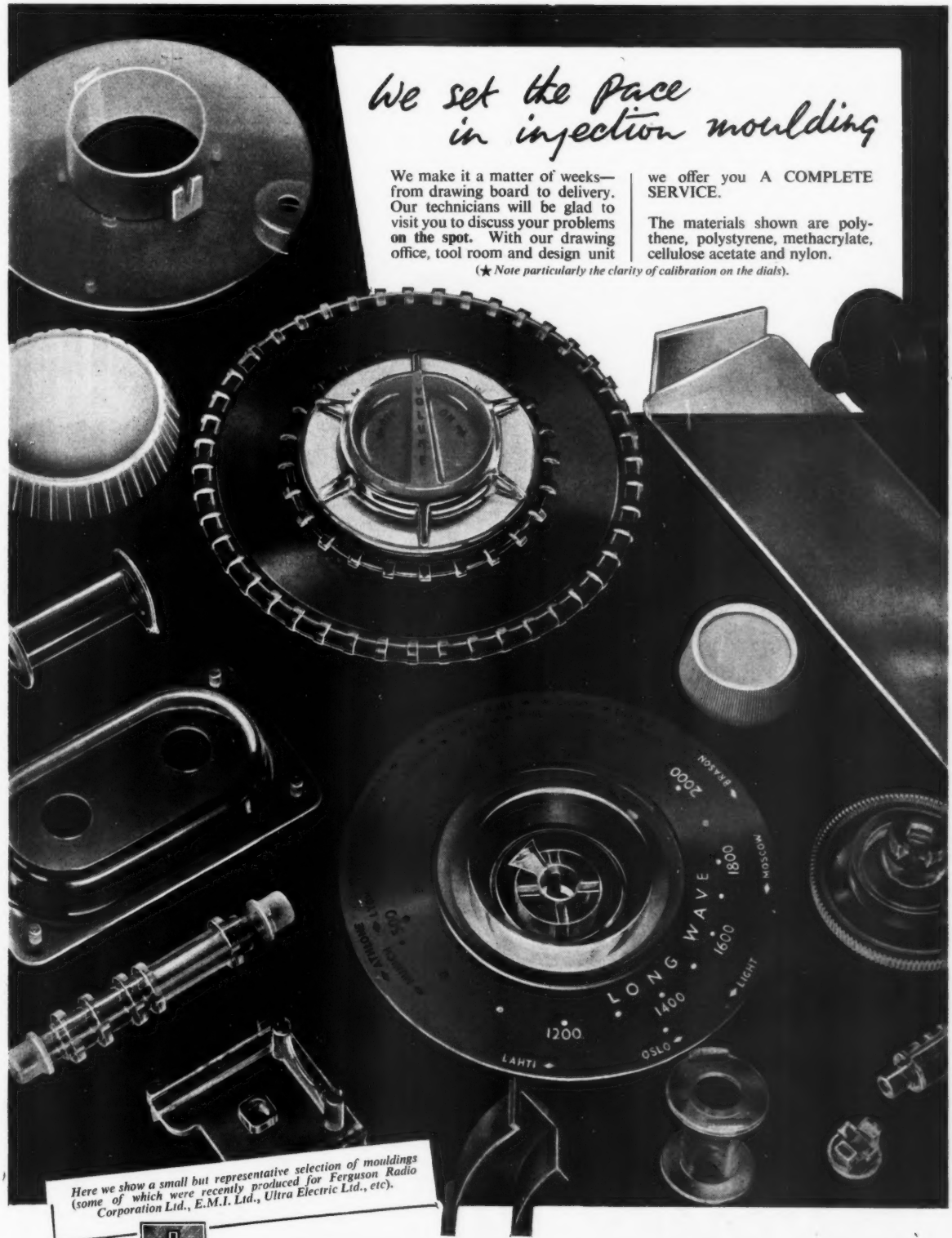
Adhesives (close-contact and gap-filling types) surface coatings, textile impregnation (anti-shrinkage).

We are also makers of
Jigs and Fixtures
Gauges
Moulds and Dies

Hornflowa LIMITED

Phone: MARYPORT 251-2
Grams: HORNFLOWA, MARYPORT

MARYPORT · CUMBERLAND



We set the pace in injection moulding

We make it a matter of weeks—from drawing board to delivery. Our technicians will be glad to visit you to discuss your problems **on the spot.** With our drawing office, tool room and design unit we offer you A COMPLETE SERVICE.

The materials shown are polythene, polystyrene, methacrylate, cellulose acetate and nylon.

(★ *Note particularly the clarity of calibration on the dials*).

Here we show a small but representative selection of mouldings (some of which were recently produced for Ferguson Radio Corporation Ltd., E.M.I. Ltd., Ultra Electric Ltd., etc).

INJECTION MOULDERS Ltd

WESTMORELAND ROAD, THE HYDE, LONDON, N.W.9

Telephone: COLINDALE 8868/9 and 8860

13143

Having a hand in Productivity

In every industry or trade, electrical equipment is the key to modern production methods. There are probably more production-boosting and money-saving devices than you know of. Your Electricity Board can help you and give you sound advice.

They can also make available to you, on free loan, several films on the uses of electricity in Industry — produced by the Electrical Development Association.

E.D.A. are publishing a series of books on " Electricity and Productivity ". Four titles are available at the moment; they deal with Higher Production, Lighting, Materials Handling, and Resistance Heating. The books are 8/6 each (9/- post free) and the Electricity Boards (or E.D.A. themselves) can supply you.

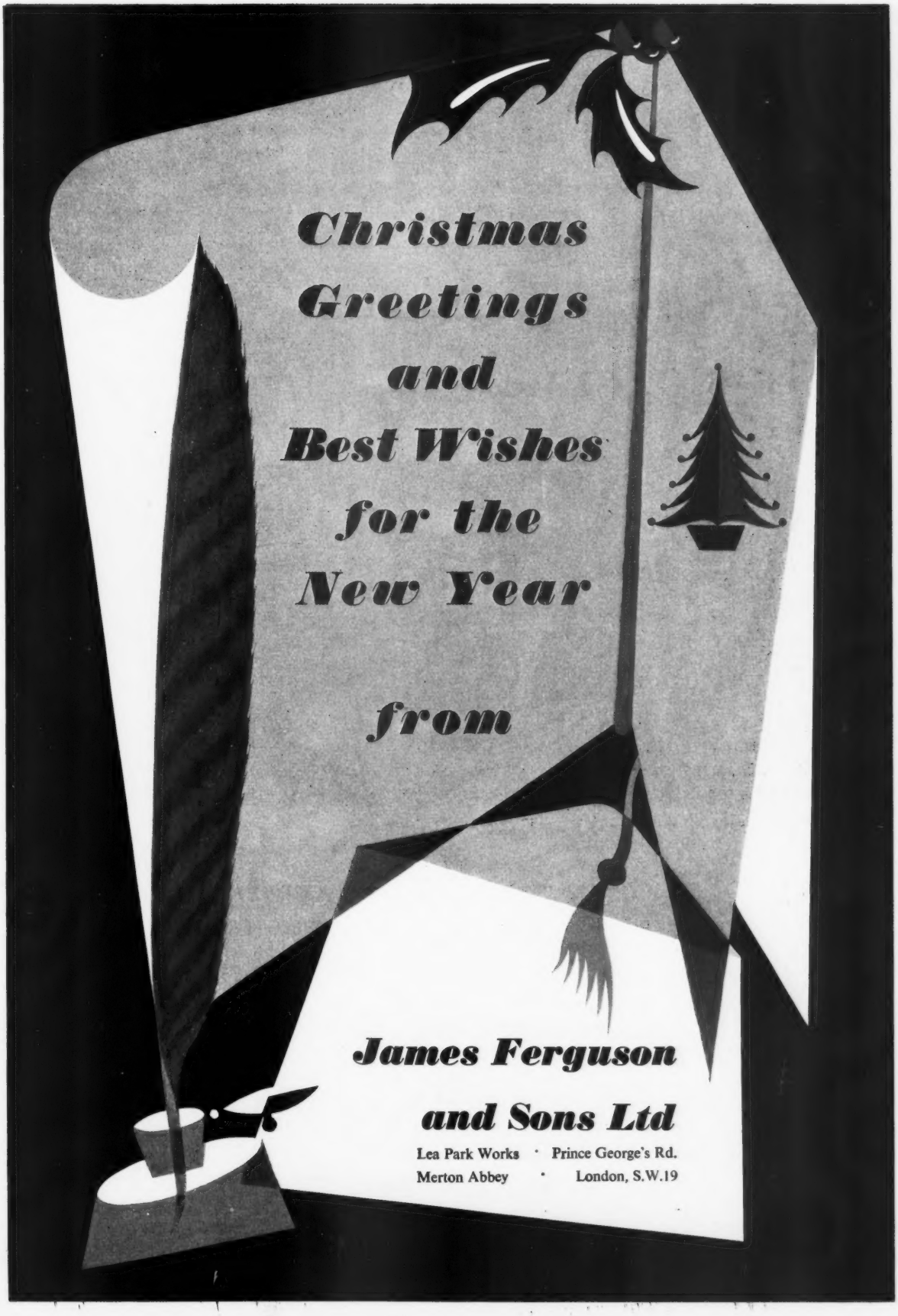
One man fires 12,000 dozen pieces a week

He does it electrically — in a multi-tunnel kiln. There are 16 tunnels and the ware in adjacent tunnels travels in opposite directions so that the incoming ware picks up heat from the outgoing. The ware is pushed through each tunnel in a series of predetermined steps, controlled electrically. All the operator has to do is to feed the ware into the kiln and take out the finished pieces—144,000 of them a week. Biscuit firing, glost firing or decorating, tea ware, dinner ware, tiles or 'fancies' — the electric kiln does it all. Higher output at low heating cost per article is

only one of the aids to higher Productivity that Electricity can bring you.

Electricity a Power of Good for PRODUCTIVITY

The British Electrical Development Association
2 Savoy Hill, London, W.C.2


Christmas
Greetings
and
Best Wishes
for the
New Year
from
James Ferguson
and Sons Ltd
Lea Park Works · Prince George's Rd.
Merton Abbey · London, S.W.19

A motorist way down in
Bicester
Was hailed by an expert, Hey
Micester!
If you listen to me
I think you'll agree
That PVC makes an effective,
economical and easy to fit
petrol tubing

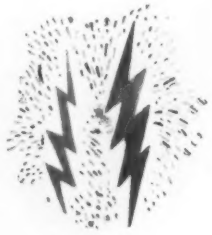
Father Christmas was
terribly worried
When to package his
presents he hurried
So he spoke to a pal
Who was at Lorival
And learned that PVC
sheeting would be an
effective, economical,
moisture-and-chemical-
proof answer to his
packaging problems

Some more limericks — from the

A keen, conscientious
ragazzo
Was thinking about his
terrazzo
This problem of flooring
Would be very boring
Were it not for the
incontrovertible fact
that PVC makes an
effective, economical,
easy-to-fit and wholly
reliable flooring strip
for use with terrazzo
flooring

Said Dante engulfed in
the fire
Of the Inferno while
plucking his lyre
Six hundred years hence
Any fireman with sense
Will specify PVC
for a remarkably
effective, tough,
durable fire hose
lining

lively lads at Lorival...



Said the Amp
to the Volt with a titter
No wonder, my dear,
you're so bitter,
This leak they can mend
In a moment, old friend
Because PVC makes
an effective, economical
insulating material for
all sorts of electrical
work

PVC, in the hands of Lorival's lively lads, can do a lot of jobs better and cheaper. Why not drop a line to Lorival? Then you can get together with the lively lads and figure out ways and means of using PVC to your advantage.

LORIVAL PLASTICS

United Ebonite & Lorival Ltd., Little Lever, Nr. Bolton, Lancs.

L64

The Campanile—Pisa *

We also lean . . .

. . . but our leaning is towards the manufacture of polystyrene which gives the moulder what he wants. Whether it is a special heat resistant grade, a material with high impact and high flexural strength or a general purpose grade—we can supply it. All grades are available as powder, sheet and extruded sections.

** The Campanile at Pisa began to lean—because of ground subsidence—while it was still being built. It was started in 1174 but not completed until 1350. The height of the tower is 179 feet. The foundations are about 10 feet deep and their circumference is only that of the tower. The structure was found to be 16½ feet out of the perpendicular in 1910.*

POLYSTYRENE FOR ALL PURPOSES

Manufactured by
STYRENE PRODUCTS LIMITED

Full information, samples, prices, etc., on application to
ERINOID LIMITED • STROUD • GLOUCESTERSHIRE
Telephone: Stroud 810

LONDON OFFICE: 96 Piccadilly • London W.1 • Telephone: GROsvenor 7111

'PERSPEX'
Displays Fine Spirit

' Perspex ' is a willing worker for British exports. Here it is, helping to sell one of Scotland's most famous products. ' Perspex ' acrylic sheet is just one of many internationally marketed plastics materials made by I.C.I.

This particular bottle, 2 ft. 6 ins. high, is made from ' Perspex ' acrylic sheet. The printed label and cap are made from another I.C.I. Product — ' Darvic ' p.v.c. sheet. To Thermo-Plastics Ltd., Dunstable, England, goes the credit for this attractive advertising novelty.

'Perspex' and 'Darvic' are registered trade marks, the property of I.C.I.

IMPERIAL CHEMICAL INDUSTRIES LTD., LONDON, S.W.1

P596

But if you use it in BULK....

From small beginnings Formaldehyde has become a bulk requirement in modern industry. And Ashworth, the *first* commercial producer in the U.K. has kept in step with its development. Today, we offer quick delivery of Formaldehyde, of consistently high standard in any required quantity. If you are interested, please write for new booklet which gives complete specifications and useful notes on handling and storage of Formaldehyde. And if you need us urgently for deliveries or for technical advice our phone number is easy to remember.

...Phone BURY 51

FOR

ASHWORTH

Formaldehyde

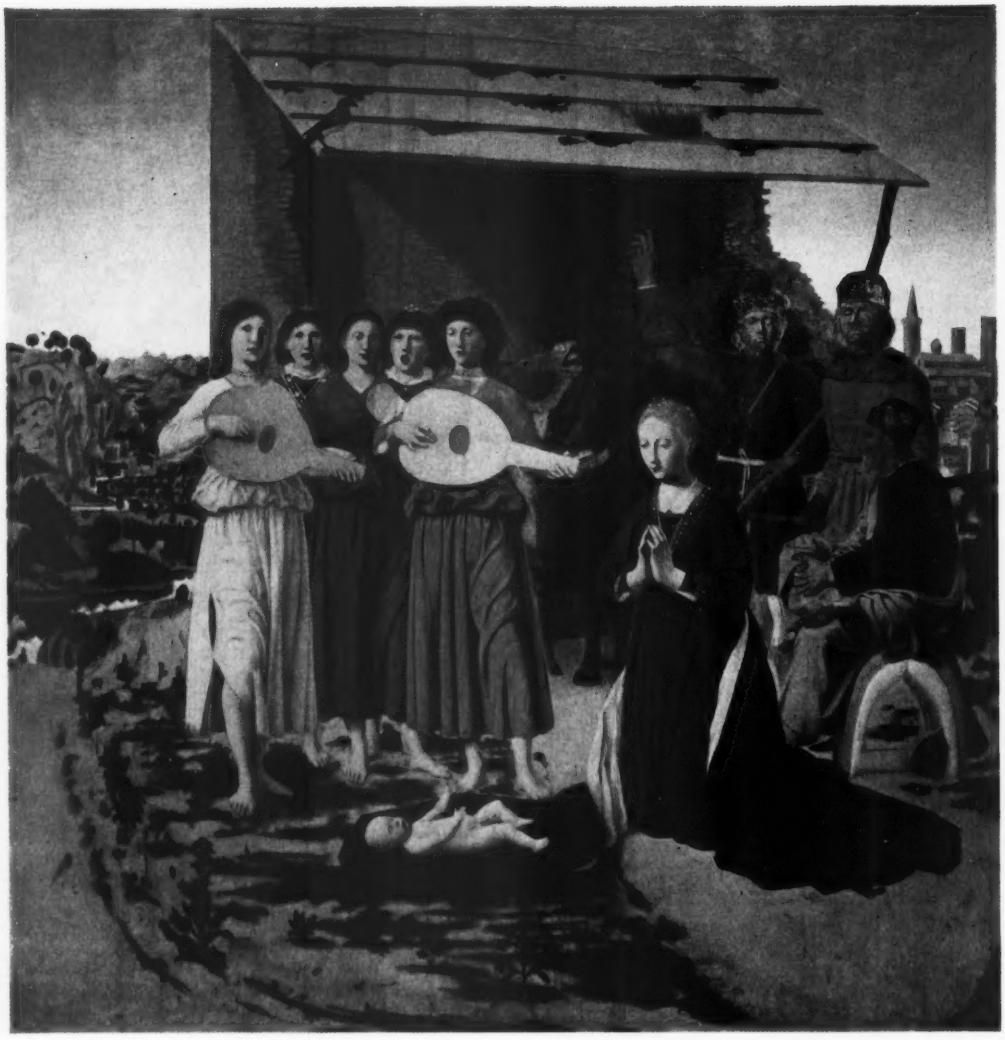
FERN HILL CHEMICAL WORKS

BURY · LANCASHIRE

For further information and technical data

Write for this booklet

Φ2



Reproduced by the courtesy of the National Gallery

The progress of colour

Colour at its most sublime . . .
colour in the hands of the artist

1 TEMPERA

The earliest known paintings, from Egypt, Babylon and Mycenean Greece, were executed in tempera. This technique calls for an albuminous, gelatinous or colloidal medium, the vehicle most used being the yolk of eggs, either alone or mixed with a little vinegar. The liquid obtained by boiling parchment or the skins of animals was also used for this purpose by early painters, while Pliny mentions milk being used as a medium.

Many of the great Italians painted in tempera, and we have chosen for illustration ' The Nativity ' by Piero della Francesca (c 1418-1492). It is a typical example of the quiet, calm beauty of tempera in the hands of a master.

Colour means much in the life of man, and plastics, with their widespread uses, are helping more and more to brighten the everyday articles we use.

EAST ANGLIA PLASTICS LTD. *52 Brook Street, London, W.1.*

TELEPHONE: MAYFAIR 4823/1973 · CABLES: EANPLAST, LONDON · FACTORY AT AYCLIFFE, DARLINGTON.

644

Hexaplas PPA

(polypropylene adipate)

a plasticiser for vinyl chloride polymers,
copolymers, and selected synthetic rubbers

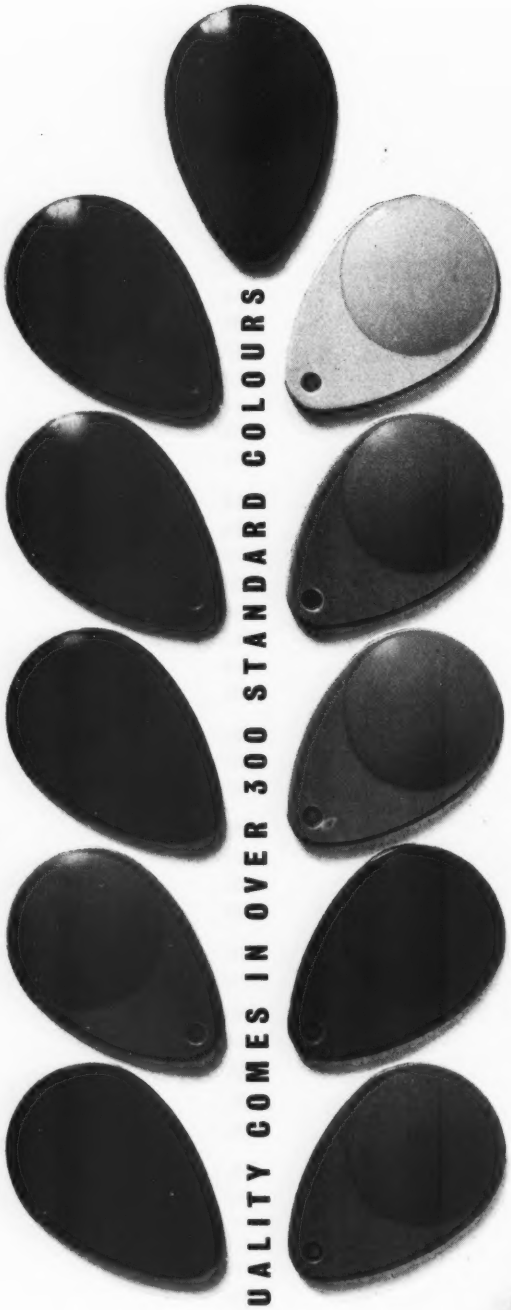
High resistance to extraction by oils • Virtual non-migration • Extremely low volatility

Full technical information on request

IMPERIAL CHEMICAL INDUSTRIES LIMITED LONDON SW1

ICI

D. 649



BEETLE QUALITY COMES IN OVER 300 STANDARD COLOURS

300 plus...

and a colour-matching service, too!

B·I·P materials—the highest quality urea and melamine moulding powders on the market—offer unbeatable colour possibilities, not only in the range immediately available, but also in the quick, accurate colour-matching service which will match even quite modest requirements without extra charge. A number of different grades of Beetle urea and Melmex (melamine) materials are available for general or specialized uses. The majority can be supplied in easy, easy/medium, medium or stiff flow types and they are made to pellet satisfactorily.

B·I·P PRODUCT AND MOULD DESIGN SERVICES

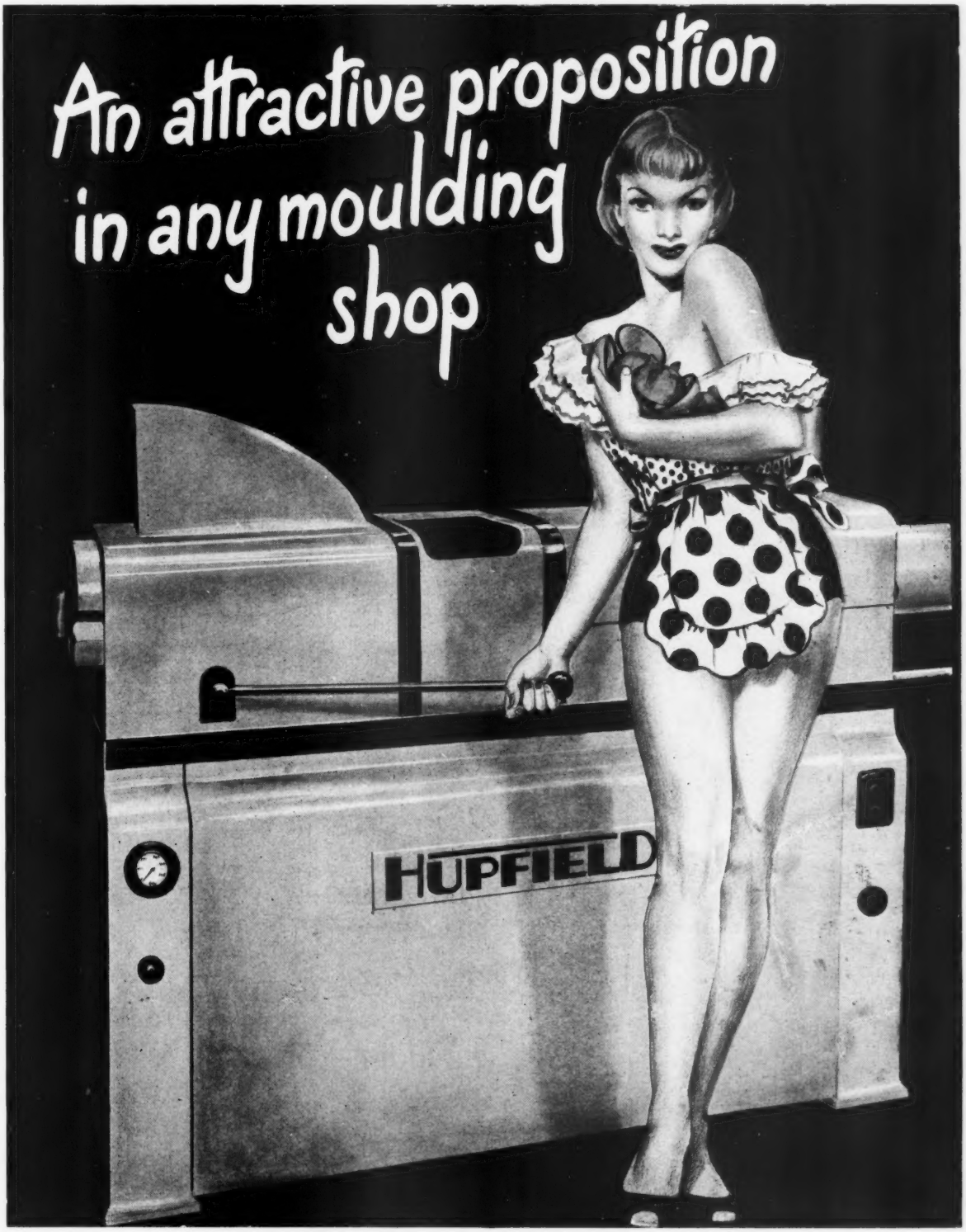
. . . are freely offered to moulders and their principals. B·I·P's designers and technicians are readily available for consultation and will prepare product designs and working drawings in the strictest confidence without any charge.

"Beetle" is a Registered Trade Mark in Great Britain and most other countries

BEETLE and MELMEX ulding powders

B·I·P

London: 1, Argyll Street, W.1 Telephone: GERrard 7971



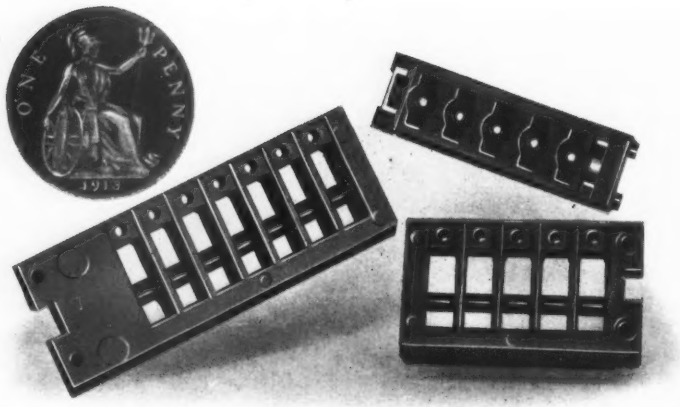
1 and 2 oz. Injection Moulding Machines

Write for particulars **Plant Installations Ltd.** *Sole Agents*

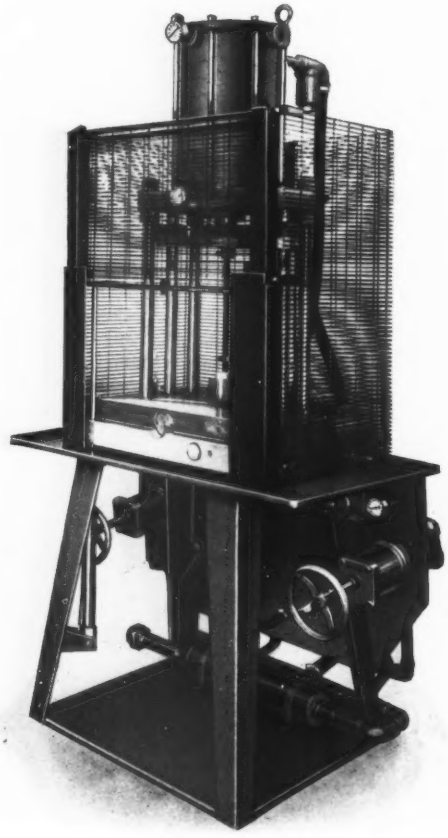
Welton Manor, Welton, Nr. Daventry, Northants. *Tel.: Daventry* 257

FOR TECHNICAL ADVICE AND DEMONSTRATION PHONE THE MANUFACTURER'S LONDON WORKS AT WORDSWORTH 4488

D



Components of television tuner units for Messrs. Philips Electrical Ltd., of London, moulded on one of these presses by Messrs. Derwent Plastics Ltd., of Stamford Bridge.



CAPACITY

Maximum force of platen	5 tons
Maximum stroke of platen	12 in.
Maximum 'daylight'	18 in.
Distance between tie bars	16 in.
Ejection force	1¼ tons
Maximum stroke ejection plunger	4 in.
Maximum curing time	60 secs.

Looking for a fast press?

This one is proving highly satisfactory for the new fast-curing Alkyd materials.

It is semi-automatic—the act of charging the die, closes the guard and starts the moulding cycle.

The lowering pressure of the platen, the position where full moulding pressure is applied, the speed and closing pressure of the guard, the duration of the cure and the amount of 'daylight' are all adjustable.

Ask for catalogue M344

E.M.B. Co. Ltd.

WEST BROMWICH ENGLAND

LARGE MODERN WORKS

THE LATEST TYPES OF PLANT

SKILLED TECHNICIANS

EVERY FACILITY FOR SERVING YOU PROMPTLY & EFFICIENTLY

Highest standards in accuracy and quality for LAMINATED PLASTIC COMPONENTS to the most exacting specifications for all INDUSTRIAL and DECORATIVE requirements

The full resources of our Technical and Experimental Departments are at your service

Send us your enquiries and prove the facts for yourself

Insulation Equipments Ltd.

TEL.: OSWESTRY 790/1 · **Oswestry, Shropshire** · 'Grams: "INSULATION"

Manufacturers of Plastic Components for all Government Departments, and approved by A.I.D. and Air Registration Board.

Protective Clothing made by James North & Sons Ltd.

FULL ALL-WEATHER PROTECTION

Poets, playwrights, and exiled Britons living in the tropics, are sometimes apt to wax sentimental over rain. But to the man who has a job of work to do, rain is a bore . . uncomfortable . . and often a great time waster. Where would this man be without his protective clothing made with GEON PVC? . . either wet outside or idle inside waiting for a break in the weather. Weather-proof clothing impregnated and coated with GEON PVC provides full all-weather protection. It withstands the hardest wear and can even be stored away wet without risk of deterioration.

Geon
Polyvinyl Materials

For further information on Geon P.V.C. write for free Booklet No. 51.

"Geon" is a Regd. Trade Mark

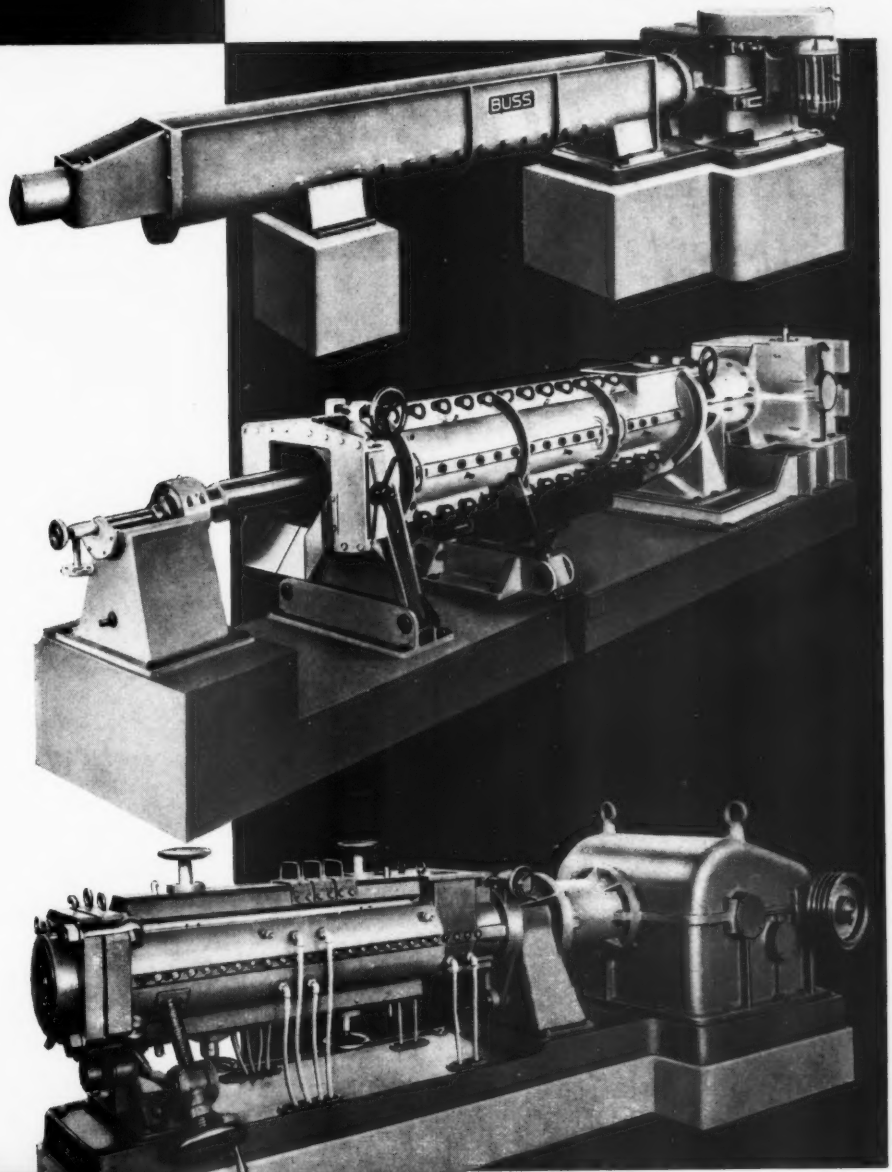
BRITISH GEON LIMITED

Sales & Technical Service :
DEVONSHIRE HOUSE · PICCADILLY · LONDON · W.1. TELEPHONE: MAYFAIR 8867

BUSS

KO-KNEADER

A continuous mixer for every job



Type M
for dry mixes.

Type K
for paste mixes and chemical reaction processes.

Type P
for kneading and compounding thermoplastic and thermosetting materials.

For details please write to Sole Selling Agents:

Aldersley
AGENCIES LTD.
TETTENHALL, WOLVERHAMPTON

TELEPHONE: WOLVERHAMPTON 52071 (3 lines)

PLASTICS AT YOUR SERVICE

"UNDULITE"
TRANSLUCENT CORRUGATED SHEETS

VACUUM FORMED
THERMOPLASTIC SHEET & FABRICATIONS

GLASS FIBRE REINFORCED LAMINATES

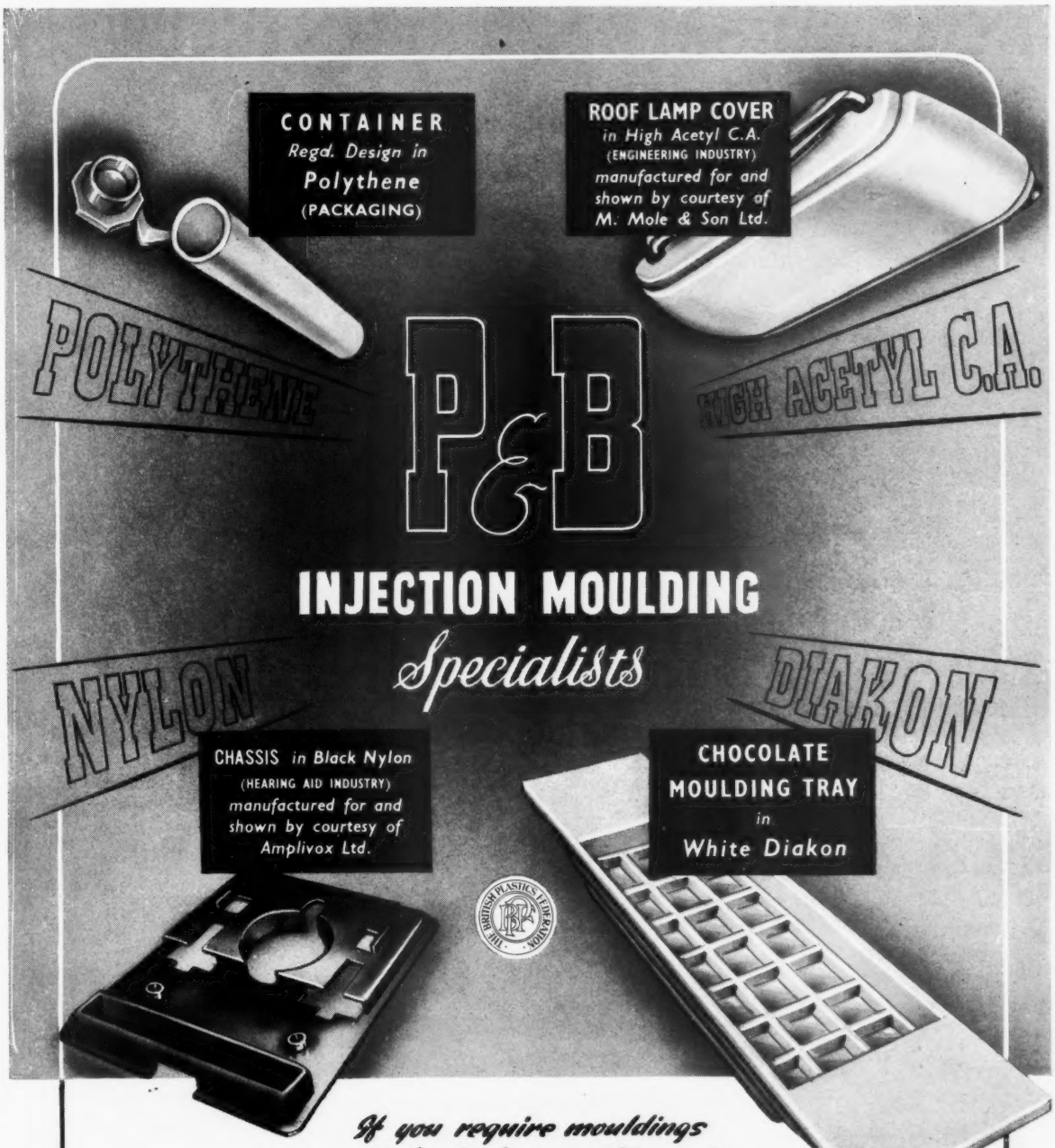
GLASS FIBRE REINFORCED MOULDINGS

"ASHLAM" LAMINATES

ask Ashdowns

ASHDOWNS LIMITED

ECCLESTON WORKS, ST. HELENS, LANCS. Tel: St. Helens 3206



If you require mouldings of the highest quality and dimensional accuracy at competitive prices — get in touch with

Punfield & Barstow

(MOULDINGS) LTD.

BASIL WORKS, WESTMORELAND RD., QUEENSBURY, LONDON, N.W.9

Telephone: **COLINDALE 2266/7/8** *Telegrams:* **PUNFIBARS, HYDE, LONDON**

COMPRESSION and INJECTION MOULDING SPECIALISTS . . .

WE can offer an extensive range of high-quality injection and compression moulding machines. These include :—

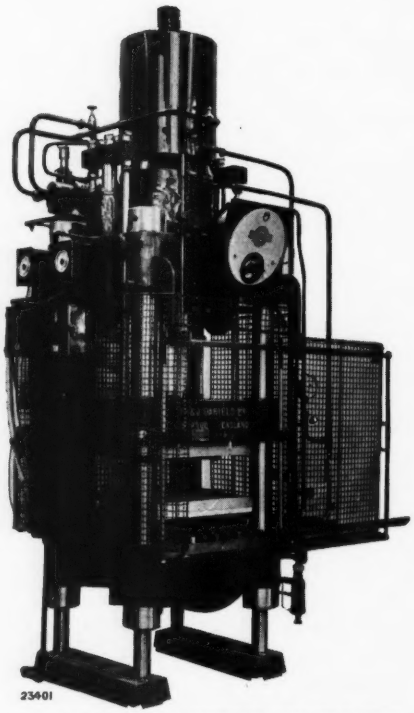
Herbert/Reed-Prentice Fully-automatic Injection Moulding Machines. Capacities 4 oz., 8 oz. and 16 oz., which can be increased using Double-Shot Mechanism.

Edgwick "HY" Injection Moulding Machine. Either semi- or fully-automatic operation. Capacity 1½ oz.

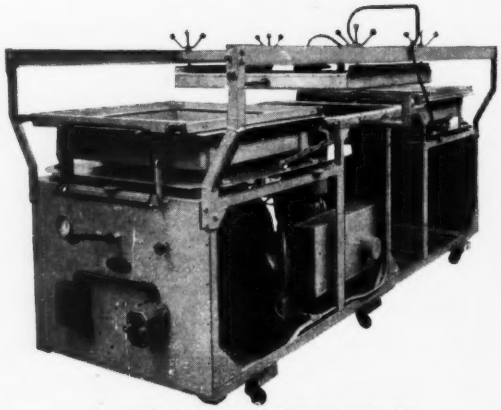
Daniels Moulding Presses in the following capacities: Upstroke 12 to 100 tons; Downstroke 28 to 500 tons; Side-Ram 100 and 150 tons; Transfer 50/75 to 500 tons; Low-Pressure 100 to 250 tons; Hobbing 500 and 1,000 tons.

We undertake the design and supply of all types of moulds to suit customer's requirements.

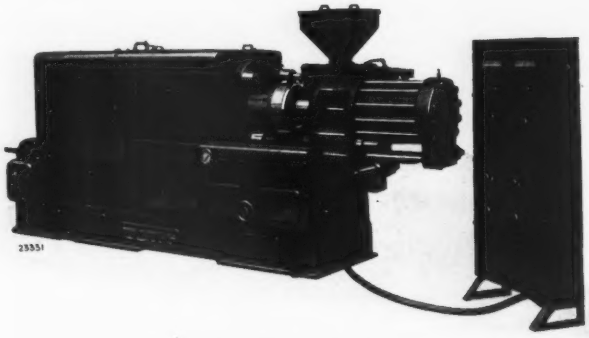
We can arrange for our specialists to visit your Works to discuss the application of these machines to your particular products.



DANIELS 150-TON DOWNSTROKE MOULDING PRESS



PULSOMETER VACUUM FORMING MACHINE (TWIN-PLATEN MACHINE)



HERBERT/REED-PRENTICE
10D-8-14 oz. FULLY-AUTOMATIC INJECTION MOULDING MACHINE

LET US SOLVE YOUR MOULDING PROBLEMS

SOLE AGENTS:—

ALFRED HERBERT LTD · COVENTRY

FACTORED DIVISION · RED LANE WORKS · 'PHONE 89221

The Brontë Centenary

The Brontës, whose centenary is celebrated this year, knew the Liversedge & Heckmondwike district well. Charlette went to school at Roe Head near Liversedge, and Oakwell Hall, Birstall, near Heckmondwike, is immortalised as Fieldhead in "Shirley". The curate Donne in that novel was drawn from the character of the Rev. Joseph Brett of Owenhope.

The Directors and staff of Birkby Ltd., send Christmas Greetings to their ever-widening circle of friends throughout the world.

PLASTICS ELO PRODUCTS

BIRKBY LTD., LIVERSEDGE, YORKS. LONDON OFFICE: 79 BAKER ST.

PHENOL

A high-quality synthetic product meeting the most stringent requirements of the plastics industry.

XYLENOLS

A grade of refined cresylic acid of distillation range approximately 215-230°C. Total tar acid content 99.5 to 100%.

Availability:

Ample supplies for prompt delivery in road tank-wagons and in 40/45 gallon drums.

For further information, consult:

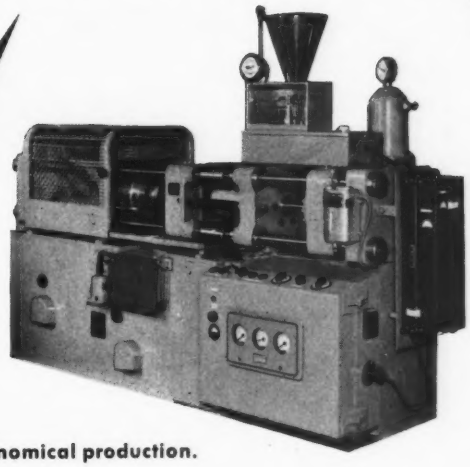
IMPERIAL CHEMICAL INDUSTRIES LTD., LONDON, S.W.1

ICI

B.244

BATTENFELD

all over the world



Experts

in 34 countries recognized that the fully automatic run of BATTENFELD injection moulding machines ensures most economical production.

BATTENFELD MASCHINENFABRIK **MEINERZHAGEN i. WESTF.** Germany

For particulars please apply to our agents:

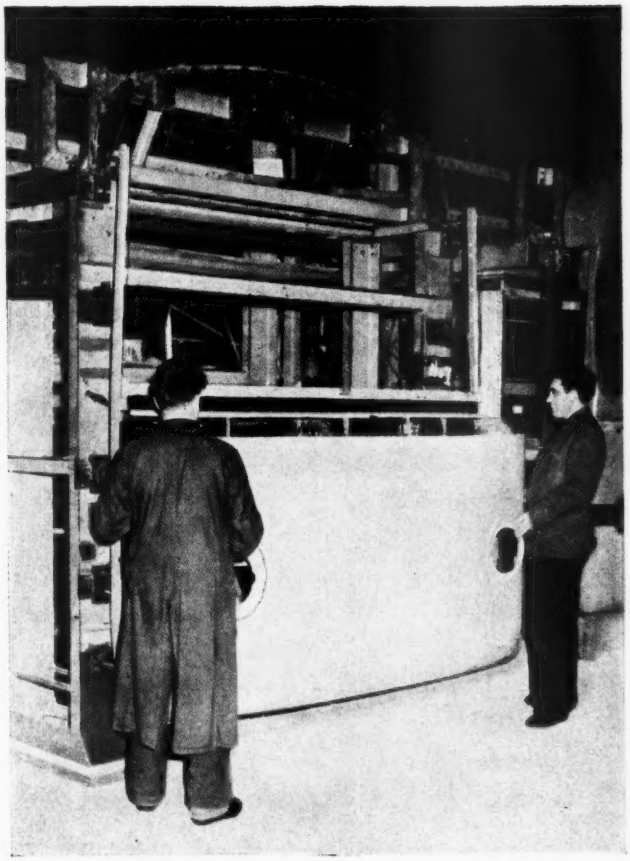
Ed. Brand Ltd., 9. St. Cross Street, Hatton Garden, London E. C. 1

FIRTH BROWN

Die Steels

for the ***PLASTIC INDUSTRY***

THOS FIRTH & JOHN BROWN LIMITED • SHEFFIELD

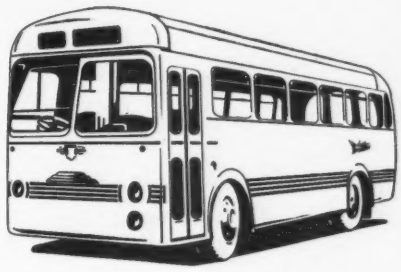


STRONGER PANELLING... LOWER MAINTENANCE COSTS...

Single-deck buses of the type illustrated are now in service having a strong, light-weight, multicurvature front panel moulded from BAKELITE Polyester Resins with a glass-fibre reinforcement. Moulded panels like this have unique qualities which can considerably reduce operating and maintenance costs. Their high impact strength enables them to withstand blows that would seriously damage conventional panelling. They will not corrode, possess good heat and sound insulating properties and are produced without a high initial tooling outlay. Should the need arise they can be repaired quickly and easily with simple equipment. Polyester mouldings are being increasingly used for a wide range of body parts including wings, wheel arches, cab tops and roofs of buses, trucks and other vehicles.

Further information about BAKELITE Polyester Resins together with literature describing production methods, applications and advantages can be obtained on request.

Photograph by courtesy of Saunders-Roe (Anglesey) Ltd. showing the large moulded front panel which is fitted below the waist-line of buses like the one illustrated.



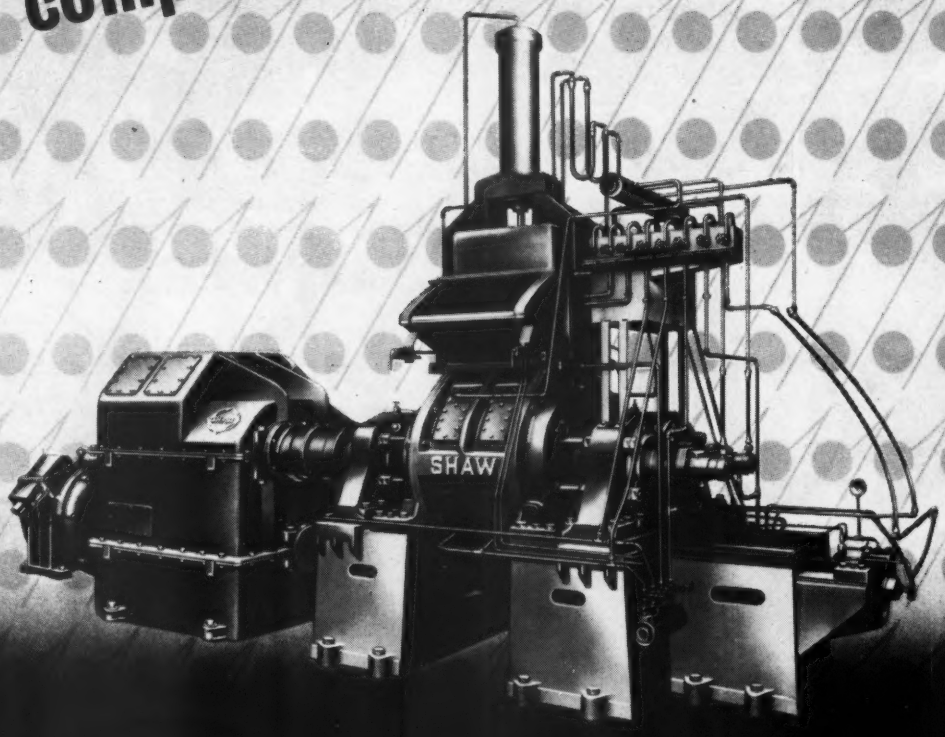
BAKELITE TRADE MARK *Polyester* **RESINS**

BAKELITE LIMITED · 12-18 GROSVENOR GARDENS · LONDON S.W.1 · Telephone: SLOane 0898

Producers of ***Bakelite*** *Polyester Resins ·* ***Bakelite*** *Phenolic & Urea Resins, Cements and Adhesives ·* ***Bakelite*** *Phenolic, Urea, Alkyd & Silicone Moulding Materials ·* ***Bakelite*** *Laminated Sheet, Rod & Tube ·* ***Bakelite*** *Glass Fibre & Asbestos Laminates · Vybak PVC Moulding & Extrusion Compounds Vybak Rigid & Flexible PVC Sheet · Warerite Decorative Laminated Plastics.* TGA R20A

F

compound interest



The Shaw Intermix is a versatile compounding machine which will handle all the usual rubber and plastic compounds and a diverse range of materials—cotton, fibre, paint, asphalt, asbestos, etc. Exclusive rotor design, anti-friction bearings which maintain rotor alignment, a unit drive and two-speed motor which allows high speed mastication—these are some of the features which make the Intermix outstanding in its field.

SHAW INTERMIX

Industry's headquarters for the best in Rubber and Plastics Machinery

FRANCIS SHAW AND COMPANY LIMITED MANCHESTER 11 ENGLAND

Phone: EAST 1415/8 Grams: CALENDER MANCHESTER Telex 66-357

LONDON OFFICE: TERMINAL HOUSE GROSVENOR GARDENS LONDON SW1

Phone: SLOANE 0675/6 Grams: VIBRATE Phone London Telex 2-2250

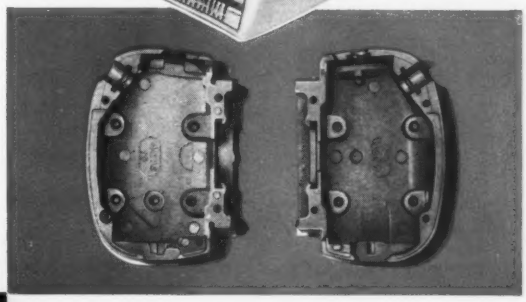
THE REMINGTON SUPER 60

A STORY OF HAIRSBREADTH TOLERANCES

Streetly moulds the cases and covers of the Remington Super 60, the latest and finest electric shaver on the market. This job typifies Streetly methods for it calls for great accuracy, fine finish and consistency of output—those essentials that can only be achieved by skilled, versatile technicians with modern equipment at their disposal.

THE COMPONENTS

The two halves of the housing. These have to fit perfectly and, although made in two pairs at a time, any cover has to fit any case regardless of the impressions in which they are made. A very high quality outer finish is achieved from the precision moulds.



THE TOOLS AND PRESSES

Four-impression tools (2 Cover, 2 Case) operate in BIPEL Type 100 Presses. Very close tolerances (±0.003 on 2″ dimensions) have to be maintained on insert and hole centres inside the moulding. The induction heated tool is fitted with auto-ejection of mouldings from the punch and with a pneumatic insert loading device which loads eight inserts at a time—four to each of two impressions. BIPEL auto-control ensures the maximum output of mouldings of a consistently high standard.

THE PELLET

The charge of BEETLE moulding material is pelleted into a single rectangular shape on a BIPEL Pelleter. The pellets are easily preheated in an H.F. preheater.

THE FINISHING LINE

Finishing is carried out on a belt conveyor system. The operations embrace filing, tapping, polishing, inspection and final packing in pairs.

B·I·P

STREETLY MOULDINGS

The comprehensive Moulding Service

The Streetly Manufacturing Co. Ltd. Streetly Works, Sutton Coldfield

Telephone: Streetly 78411

We've got this taped

THIS tape application is just the job for Empire. For over 50 years, our Empire varnished insulating materials have been used in all spheres of the electrical industry in many parts of the world. Our extensive Empire range includes varnished cloths, silks, papers, woven glass, nylon and Terylene, both black and yellow, supplied as sheet in rolls or as tapes both straight cut and bias, as well as insulating sleevings using cotton, silk and glass bases.

Keeping Electricity in its proper place is the business of

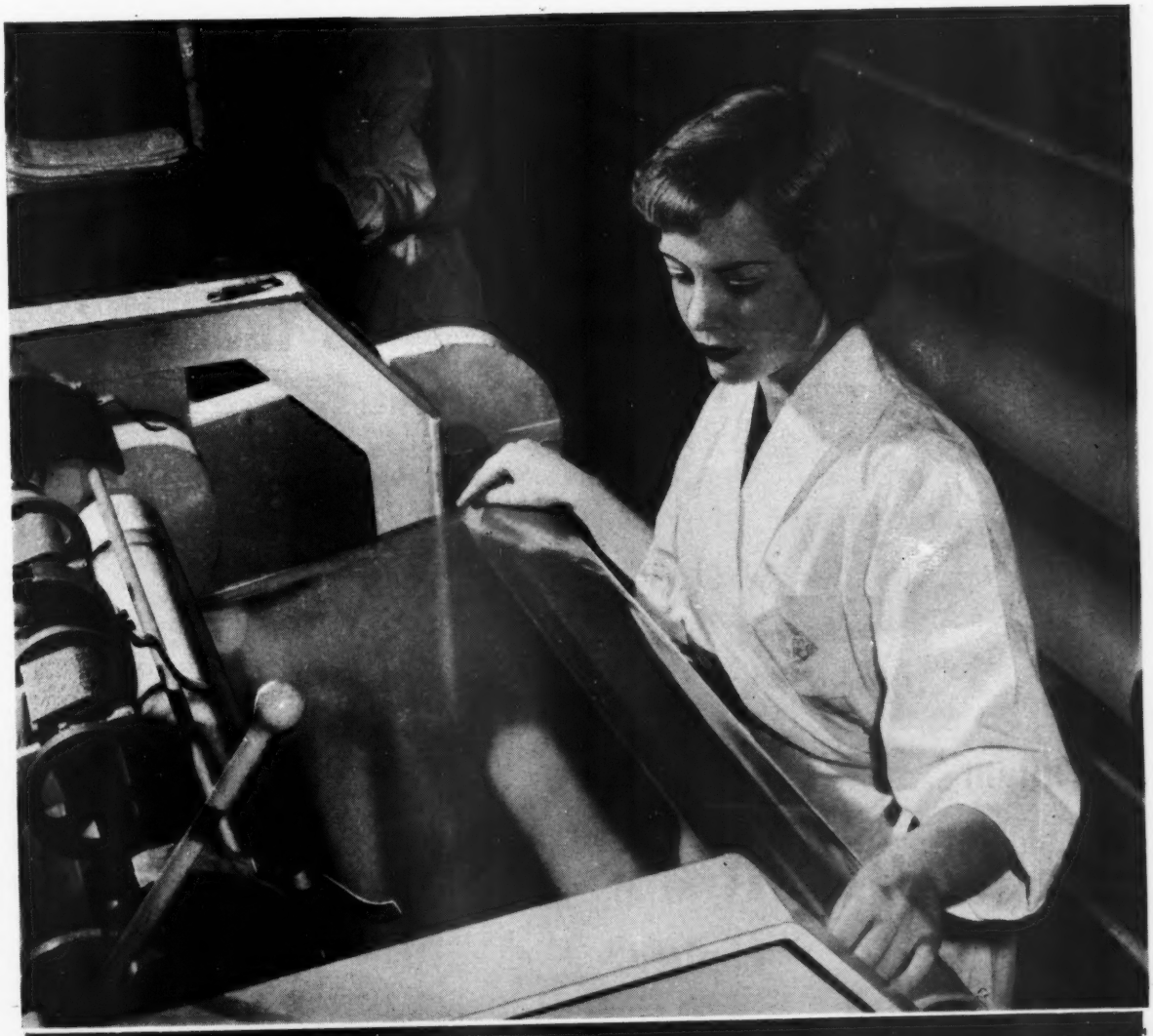
m and i

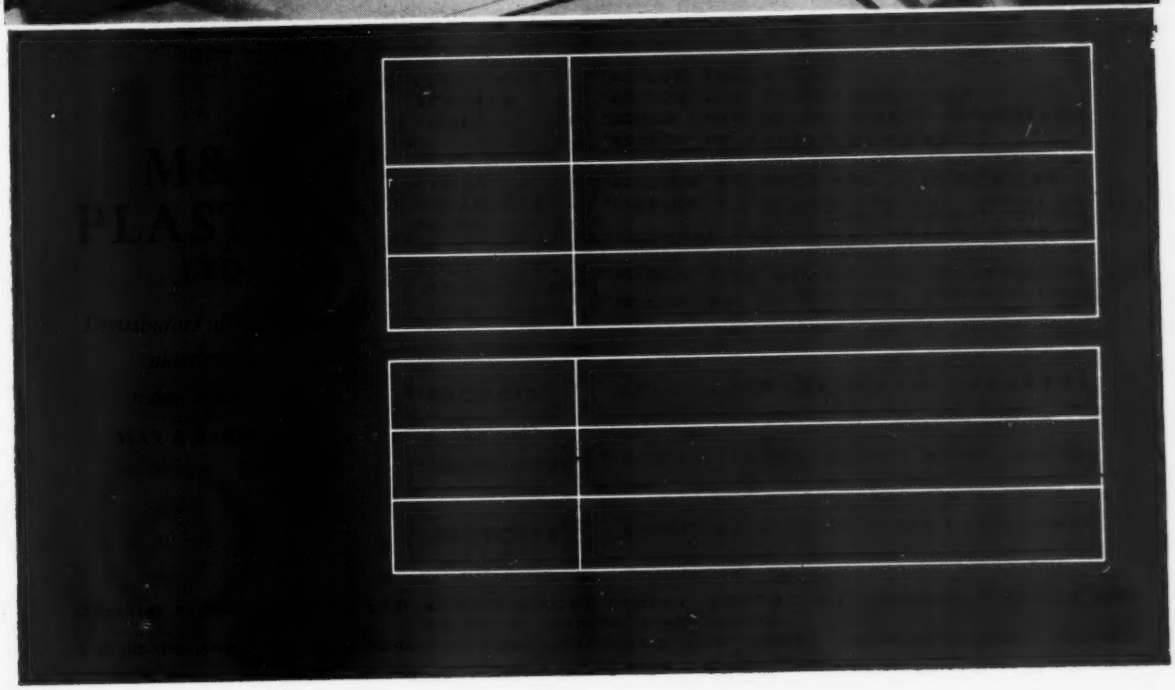
THE MICANITE & INSULATORS CO. LTD

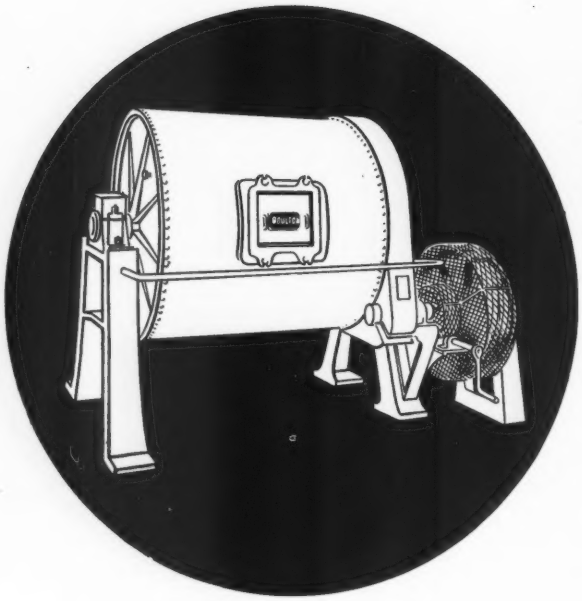
EMPIRE WORKS · BLACKHORSE LANE · WALTHAMSTOW · LONDON · E.17

BRANCH OFFICES at BIRMINGHAM · CARDIFF · GLASGOW · MANCHESTER and NEWCASTLE-UPON-TYNE and representatives in most countries throughout the world. In CANADA, MICANITE CANADA LTD.

Manufacturers of MICANITE (Built-up Mica Insulation). Fabricated and Processed MICA. PAXOLIN Laminated Materials. PANILAX Laminated Materials and Mouldings. EMPIRE Varnished Insulating Cloths and Tapes. HIGH VOLTAGE BUSHINGS & TERMINALS. Distributors of Micoflex-Duratube Sleevings, Micoflex-Durasleeve (Plastics-covered flexible metal conduit), Durajoint (Patented expansion jointing for concrete structures) and Kenutuf Injection Mouldings (in most thermoplastics including P.V.C.)







BALL MILL

Machinery & Apparatus for the Plastics Industry

BALL MILLS—up to 8 ft. diameter. In cast iron steel including stainless steel with mirror finish if desired, porcelain, with alternative linings such as rubber. We also specialise in the relining of existing mills.

GYRATORY SCREEN— the most efficient and reliable machine of its type yet produced. Handles wet or dry materials of all types. Higher output and accuracy. Adjustable motions to suit all types of material. Made in 4 sizes.

William

Boulton

Limited

PROVIDENCE

ENGINEERING WORKS,

BURSLEM,

STOKE-ON-TRENT.

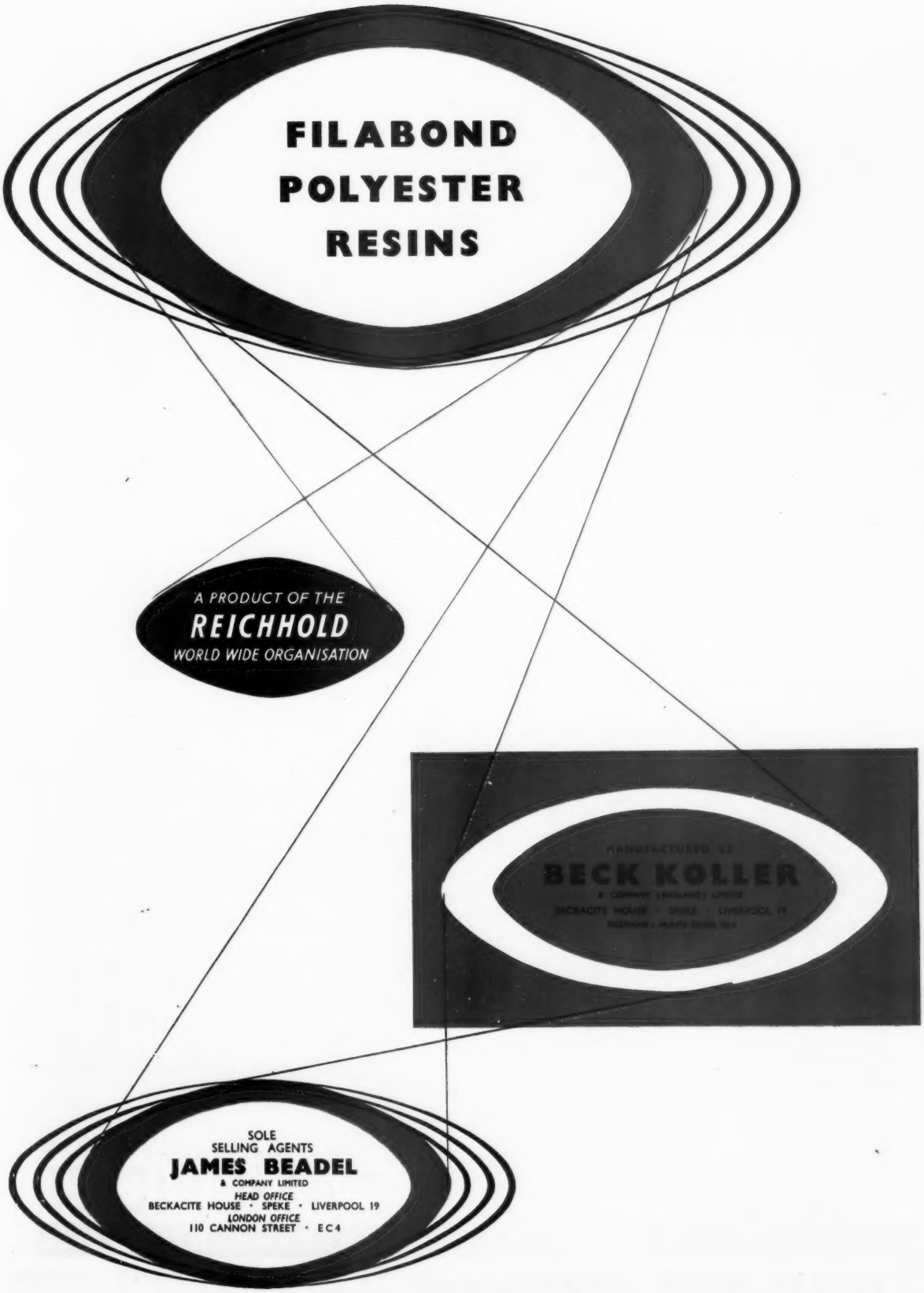
Telephone: Stoke-on-Trent 88661 (5 lines)

Telegrams: Boulton, Burslem.

We design and construct many types of plant for the process industry including filter presses, agitators and mixers—may we solve your particular problem?

GYRATORY SCREEN

WB16

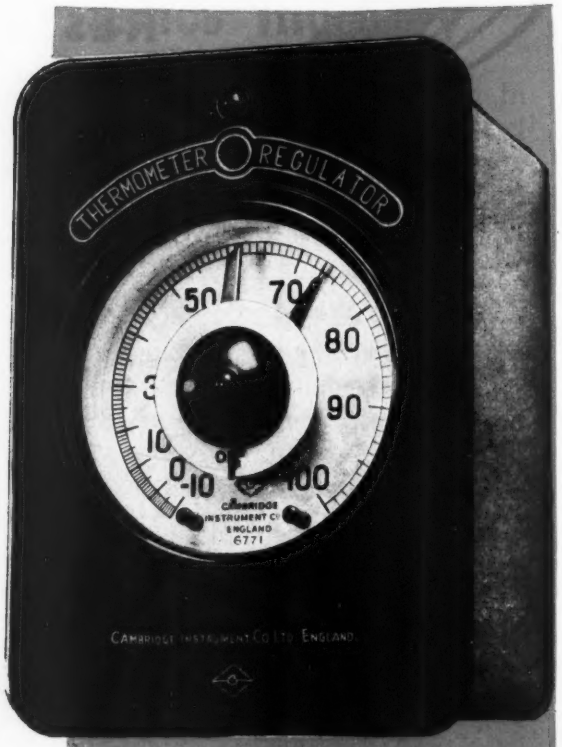

FILABOND
POLYESTER
RESINS
A PRODUCT OF THE
REICHHOLD
WORLD WIDE ORGANISATION
MANUFACTURED BY
BECK KOLLER
SOLE
SELLING AGENTS
JAMES BEADEL
& COMPANY LIMITED
HEAD OFFICE
BECKACITE HOUSE • SPEKE • LIVERPOOL 19
LONDON OFFICE
110 CANNON STREET • EC4

TEMPERATURE CONTROL OF MOULDED PRODUCTS

The
CAMBRIDGE THERMOMETER REGULATOR

is specifically designed for plastics moulding presses, and is standardised equipment on many well-known makes. It controls the temperature accurately and continuously to close limits, securing maximum economy in power consumption and the elimination of temperature-spoiled work. Its robust construction ensures long service without attention.

An important feature is the newly developed "**FLEXIFORT**" capillary tubing, between the bulb and the instrument, the extreme flexibility of which entirely eliminates risk of breakage due to the continual flexing of the tubing by reason of the movement of the platen.



SPECIFICATION
Ranges 250° to 400°F.
or 120° to 200°C.
with 6 feet "FLEXIFORT" tubing
and bulb with swivel connections.

Details are given in
SHEET No. 276-P.
May we send a copy?

CAMBRIDGE
INSTRUMENT CO. LTD.

PLEASE NOTE ADDRESS → **MECHANICAL THERMOMETER DIVISION**
FRIERN PARK, N. FINCHLEY, LONDON, N.12

Plastics

DEALING WITH THE MANUFACTURE, USES AND POTENTIALITIES OF PLASTIC MATERIALS

PROPRIETORS: TEMPLE PRESS LIMITED

CHAIRMAN and MANAGING DIRECTOR: ROLAND E. DANGERFIELD

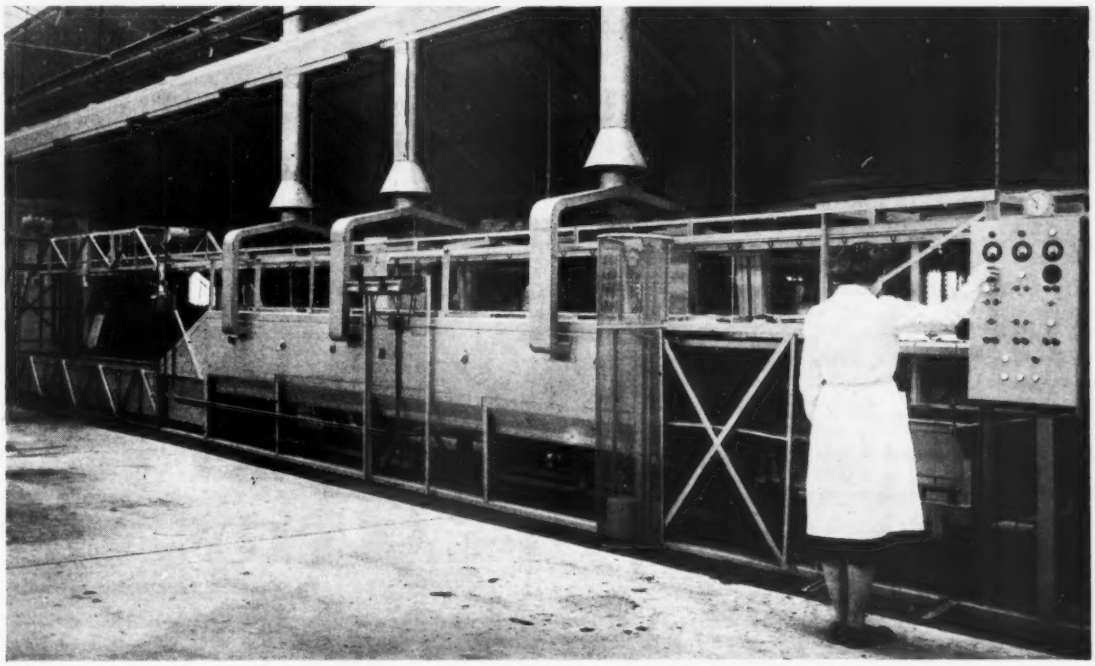
CONTENTS

	Page
Editorials	401
Moulding Powder and Shot	402
Automatic Dip-moulding	403
Production Control	407
Plastics in the Service of Man	410
World's Industry Employs Plastics	413
Plastics Aid Residual Products Conversion, by T. A. Dickinson	414
Petrochemical Survey	416
Electric Cutting Saw for Laminates	417
Drying and Heating by High-velocity Air	418
Plastics in High-speed Aircraft	422
New Productions	423
Plastics News	424
Talking Shop	429
Letters to the Editor	430
Properties and Testing of Plastics Materials, Part 2 (Continued), by A. E. Lever and J. Rhys	431
Fifth Meeting of ISO/TC 61—Plastics	434
Patent Review	435

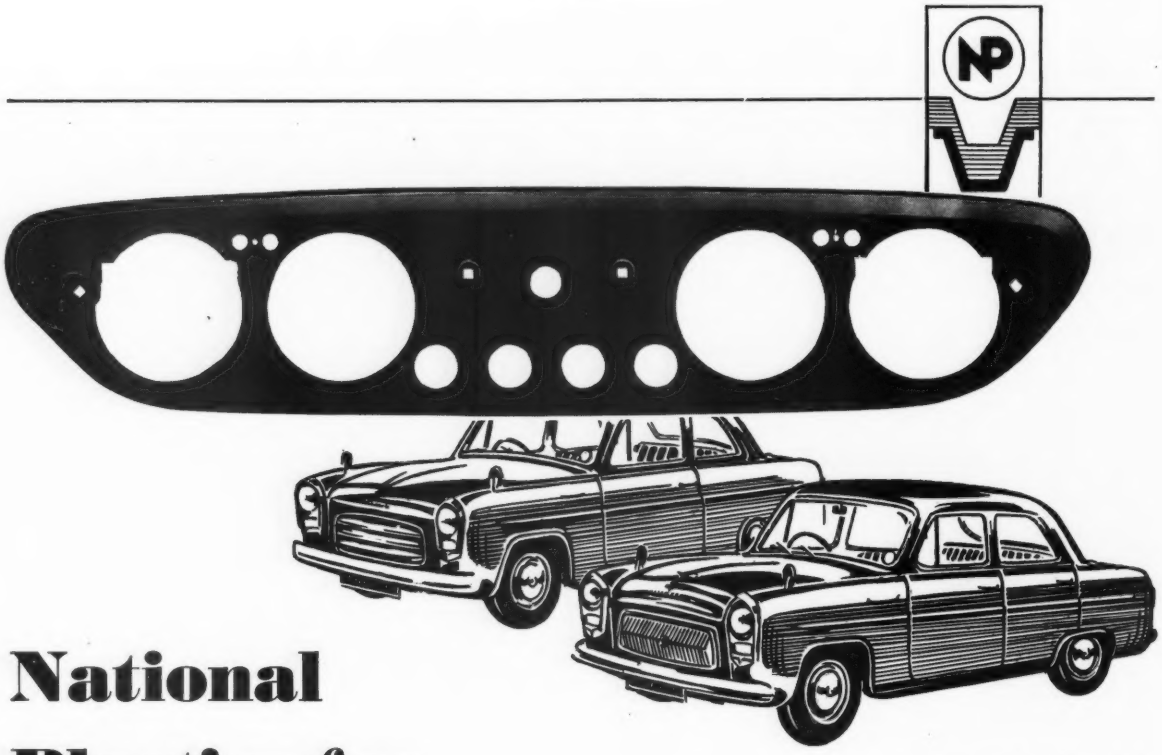
EDITOR: M. D. CURWEN, B.Sc., A.R.I.C.
ASSISTANT EDITOR: C. W. WELCH.

Printed in England and Published monthly by the Proprietors, Temple Press Limited.
Annual Subscription Rate 34/-. Shorter periods pro rata.

Editorial, Advertisement and Publishing Offices: Bowling Green Lane, London, E.C.1
Telephone: TERminus 3636



New machine at Creators, Ltd., for the automatic dip-moulding of p.v.c.



Illustrations by kind permission of Ford Motor Co. Ltd.

National Plastics for FORD de luxe models

That a National Plastics moulding should be chosen for the remarkable new Anglia and Prefect de luxe cars is regarded at our Walthamstow factory as a reward for work well done. For there, since the first plastics facias for Ford were designed and made some eighteen years ago, components for all the most important Ford cars have been produced without break.

The production of plastics mouldings on such a scale as this is our special business. Industrialists with large plastics projects in mind are very welcome at Avenue Works, to see the way such large scale production is organised and to discuss technical points with our designers.

NATIONAL PLASTICS

NATIONAL PLASTICS (SALES) LTD. Sales Organisation for BRITISH MOULDED PLASTICS LTD.
Avenue Works, Walthamstow Avenue, London, E.4. *LARkswood 2323*

NP31

Plastics

VOL. XX. No. 221 DECEMBER, 1955

EDITORIALS

Reinforced Plastics

Two meetings, both of importance to the plastics industry, took place during the month of November. Both were on very similar subjects but, because the report we have received of the one and the evidence of our own ears at the other are so diametrically opposed, the differences between them must be thrown into high-light.

The first meeting, organized by the British Plastics Federation, took place at Harrogate, on November 1 and 2, under the title " Reinforced Plastics Conference," the discussion dealing with seven papers read by experts in the aircraft and other industries. Apparently boat building should have been one of the subjects discussed, but this does not appear to have been the case.

The pronouncement about the holding of the meeting reached us on October 28. At its foot was the note: " To ensure the freest possible exchange of methods and views the discussions are strictly ' off the record,' no note being kept of them and no reporters being present. A statement may be issued to the Press of the Conference."

We cannot pretend to like the pontifical " may " in the above sentence, nor the gratuitous implied slur cast on reporters as a whole, including the editors of scientific and technical journals, by forbidding their entry to the meeting. Some of the latter, controlling journals in the fields of chemical and physical technology, aircraft design, general engineering and plastics technology, have spent more years in following intelligently the growth of modern reinforcements than most, and are not necessarily so treacherous in their search for sensation that they are always ready to break their words on " off the record " statements. We should have imagined that the hierophants of the British Plastics Federation had heard that the Prime Ministers of England and the Presidents of the United States have complete confidence in the Press, on occasions probably no less important and secret than the convention under discussion.

There we should prefer leaving the matter, but we must report on two points. The first refers again to the aforesaid pre-meeting notice which also contains the sensational promise by the Director of the British Plastics Federation that " The way towards mass production of structures using this material will figure largely in the discussions." This is exciting news which must have passed our notice in our visits to various works where we had reached the conclusion that speed of production was not the general outstanding attribute of the reinforced plastics processes. We do not demand a definition or specification of the words " mass-production," but at least production should be compared, when disseminating knowledge to the public, with the speed of production of traditional materials and with the public's conception or knowledge of the term. Of all the successes in this industry so far achieved how many can come under the above heading? Paper-phenolic laminates, perhaps, because of the high proportion of mechanization. Of the newer laminates, possibly helmets and boats, and the latter only because wooden boat building is probably no faster than when practised by Noah; we dare swear that the rate of constructing a modern glass fibre/polyester one does not surpass that we saw at the works of Merron, Ltd., at Bow Bridge, in 1941. The boats made then were phenolic reinforcements. As for tube making from these materials, new high figures of rate of production have clearly been reached, but we wonder if it attains the speed of production of aluminium tube, of polythene, phenolic or even of p.t.f.e. tubes. Above all, why, in Heaven's name, is it at all necessary, at this point in time and at a scientific and technical meeting, to use the words " mass-production " in connection with any of these structures that are so obviously specific in their application and where knowledge of certain properties, e.g., ageing, is still lacking?

—and High-speed Aircraft

The second point about this same meeting and the far more important, refers to the report of it issued to the Press. Headed " Plastics in Supersonic Aircraft—A Challenge to Metals," it contains the following sentence: " ' Temperatures on the outer skin of a supersonic aircraft run into hundreds of degrees Centigrade,' Mr. H. A. Collinson, chairman of the Conference, told the Press afterwards ' and the progress made in reinforced plastics as revealed in our discussions shows that they present a real challenge to metals in this field '." Title and sentence were published by most dailies throughout the country with obvious enthusiasm.

Now this categorical statement implying that reinforced plastics stand up well to the rise in skin temperature of supersonic aircraft, requires closer analysis. As we have said, we do not know what was discussed at the meeting but we do know that members of the Royal Aircraft Establishment and of the Ministry of Supply were present and that among those of the Ministry was Dr. M. G. Church, B.Sc., A.R.I.C., A.P.I. Dr. Church has for us a great reputation, before the war at the Government Laboratories and during the war as an officer at the Ministry of Supply. In this capacity he has proved himself a scientist of a high order, wide in his experience, careful of his statements and completely balanced and wise in his views. We do not even know whether he spoke. What we do know is that he did speak on the same subject at a previous meeting of the Plastics Institute and then on November 17, he elaborated on his previous statements, at a meeting of the London Section of the Plastics Institute in a paper entitled " Problems Associated with the Use of Plastics in High-speed Aircraft."

On another page in this issue we publish a short abstract of Dr. Church's paper, which we hope will prove of sufficient interest until the full text of it is available in the Transactions of the Plastics Institute. It deals factually with the problems as they exist. From them it is clear that there are two problems, one of erosion due to rain and the other arising from the high skin temperatures attained at very high velocities. It is clear that for low speeds the plastics so far employed are quite satisfactory. At very high speeds, however, conditions change rapidly. Erosion due to rainstorms affect aluminium, polymethyl methacrylate and glass-fibre structures

adversely; at Mach 2 (about 1,500 m.p.h.) the energy in a rain-drop of 1.9-mm. diameter is 20 foot pounds. But the effect begins at quite low speeds: "At 500 m.p.h. the erosion in rain is so rapid that in a matter of minutes a conventional glass reinforced/polyester laminate is eroded to a state in which it is useless and may begin to disintegrate completely." Even the same laminates protected with neoprene coverings suffer at the same velocity, the time of protection being given as 3 hours.

The other important factor in high-speed flying is in the rapid rise in skin temperature with increase in speed; at sea level it reaches 219° C. at Mach 2 and 847° C. at Mach 4. "We can expect that within a few years," said Dr. Church, "we shall be faced with flight approaching M = 2, and within five years or so, I imagine we shall have aircraft designs capable of flight at much higher speeds"; and again, "This then is our problem. We are now on the fringe of air speeds in which aerodynamic heating effect is beginning to aggravate the material supplier. Aircraft and aircraft engine design is advancing at such a rate that soon we shall be faced with a situation where the advance is being held back because the materials required are not available."

We throw the ball back to the spokesmen of the Reinforced Plastics Convention.

Moulding Powder and Shot

The Daily Telegraph reports a contract between the Japanese Sumitomo Chemical Company and Imperial Chemical Industries, Ltd., to produce polythene under licence in Japan. This would dispose of the widely held rumour that the new Ziegler and Phillips "low pressure" polythene would oust I.C.I.'s much older h.p. polythene because of the former's specific properties. As stated in *Plastics* last month there is no indication of this possibility for many years, if at all. Nor is there evidence yet that the new material will be cheaper.

Polythene v. Polythene?

In the general excitement most writers on the subject appear to have forgotten one important thing about polythene—how much the country, and indeed the whole world, owes to I.C.I. for its discovery. It gave our Battle of Britain pilots the edge on the Germans, and who knows what the outcome would have been without it? It gave the world a new plastic that in the 10 years of its life since the end of the war has developed into a general utility and constructional material that has opened up new avenues in industry undreamed of before its coming. There is not much sentiment in business nor in chemical manufacture, but wouldn't it be nice if Professor Ziegler and Phillips sent letters of thanks for the lead given them?

* * *

This modern continuation of the polythene story which began in 1933 brings to my mind a piece of pre-history which has never appeared in any journal dealing with plastics—because it doesn't deal with polythene. But I think it's worth while repeating, for it refers to the remarkable research work that had been carried out since 1920 at the Imperial College, South Kensington, by Dr. W. A. Bone, F.R.S., and his band of workers on gaseous explosions under high pressures. In 1927 I was told by an old friend of mine, the late Professor J. W. Hinchley, father of British chemical engineering, and of the Institution of Chemical Engineers, that a good story was there to be had for the asking, so I went along to see Dr. Bone and his assistants, Drs. Newitt and Townend, who were responsible for so much of the design and construction of the "bombs" and ancillary plant used to contain the gases under high pressure. There were also catalytic tube units capable of withstanding pressures up to 500 atmospheres at 500° C. One "bomb" I examined was used to withstand 1,000 atmospheres (nearly 15,000 lb. per sq. in.) pressure: it was a cylinder 10¼-in. long by 8-in. diameter and had been machined from a solid forging of open-hearth steel. Out of its centre had been cut a spherical cavity 3-in. diameter (240 c.c.s capacity) and it was fitted with admission valve, ignition plug, Petival manometer and quartz window to observe the explosion spectrographically. Among the other bombs I saw was one for experiments carried out at 20,000 atmospheres (nearly 300,000 lb. per sq. in.). All this, as I've said, had nothing to do with polythene. The study was entirely on gaseous fuels but it is worthy of note that I.C.I. Ltd., was among those who gave grants for the work on a generous scale. So far as I am aware, none of these bombs was taken to the I.C.I. works, where polythene was discovered during researches on the effect of high pressures on chemical reactions. A bomb was specially designed for the purpose, but no doubt the lessons learnt at Imperial College came in useful. To that extent I bask in a kind of a sort of reflected glory that I had "handled" a high-pressure bomb so many years ago.

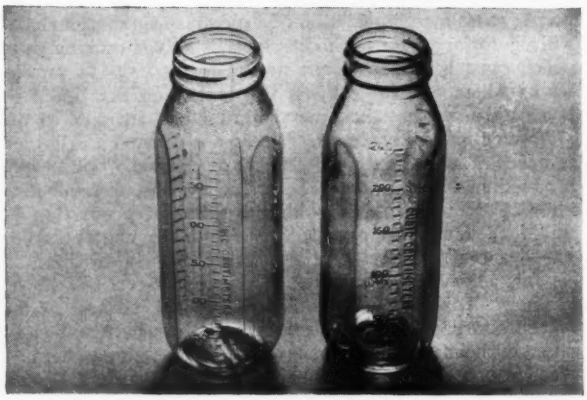
And its Pre-History

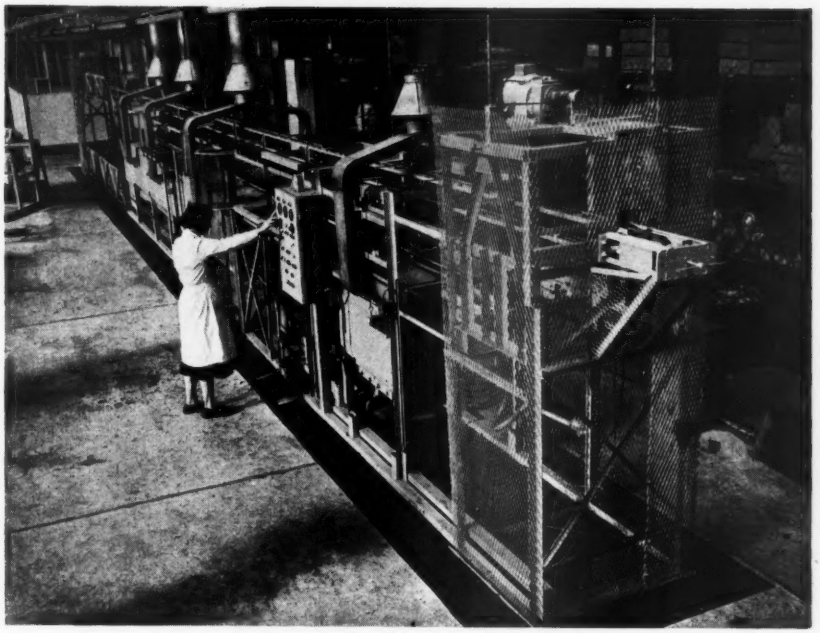
* * *

No one yet can really give much of a peep into the future of plastic bottles except to say that it is an exceptionally bright one. The yearly output in this country must by now be over 20,000,000 and this is mostly confined to the cosmetic and pharmaceutical trade for the greater part, and for the lesser to the chemical industry. So far as the first is concerned, I look forward to the time when every glass bottle in every bathroom in the country is replaced by a plastic one. It's getting that way in my own—in spite of what the physicists say about permeability of polythene, my bottle of hair-oil, delicately perfumed with Blogg's "Péché Mortel," and my after-shaving lotion, "Glandering Moment," specially distilled for me in a Huddersfield benzol works, are both kept in polythene bottles. However, polythene may not have it all its own way. As I observed last year, that extremely intelligent and progressive company Industrial Appliances, Ltd., has been working hard on nylon bottles and has now entered a new field with them—feeding bottles which can readily withstand high-temperature sterilization. I show one of these below (left) and also a normal one in glass. If you can't see it from the photograph you may take my word that the nylon one is the more optically transparent! It weighs 1 ounce (28 grammes) against the 7 ounces (196 grammes) of the glass one. I hope the medical profession knows all about this.

Plastic v. Glass Bottles

DOGSBODDY.





Automatic Dip-moulding

One of the first companies to investigate the dip-moulding of p.v.c. dispersions was Creators Ltd. A new factory at Woking has recently been completed for them, and they have now put into operation a large automatic plant for this method of moulding. Its construction and operation are described herewith.

Fig. 1. General view of new machine recently completed, for high-speed moulding with p.v.c. dispersions.

DIP-MOULDING is now a generally recognized technique for the fabrication of many industrial components. Its principle will be familiar to readers of this journal and consists essentially of the use of relatively low-cost formers, these being dipped into tanks of p.v.c. dispersions, and subsequently transferring the moulds to ovens where the coating is "cured." Productions of this kind have been regularly featured in *Plastics* for some years and one of the companies that has specialized in the process is Creators Ltd. Recently the company moved into new and very much enlarged premises at Sheerwater, Woking, and, although these have been occupied for only some six months, the foundations for considerable extensions are already under construction and should be ready at an early date.

The economic advantage of dip coating has always been bound up with the fact that tool costs are very much lower than with the comparable injection-moulding process. Aluminium is normally used for the fabrication of tools. Secondly, production rates can be extremely high with this process. Thirdly, the production of articles with long draws and extensive undercuts is a relatively simple matter. For this reason, a steadily expanding market has been created for mouldings of this kind, for example, dust excluders, handlebar covers, flexible jointings and the like. Two of the leading motor manufacturers, recognizing the technical and intrinsic value of flexible p.v.c., have been especially concerned to encourage the growth of this technique. It is to the credit of this company that the majority of pioneer work has been done here and always outstripped that carried out in the United States. It is also appropriate here to mention the work of the raw-material manufacturing companies, who have done so much to make available p.v.c. materials especially suitable for this work.

The introduction of a semi-automatic or completely automatic machine for preforming the process was, of course, only a matter of time and here we have to compliment Creators, and particularly the managing director, Mr. A. C. Anselm, on their achievement in being the first to render this principle effective. Both in construction and manufacture the machine is entirely the work of the company and is the outcome of extensive experimental work and a pilot plant machine constructed some three years ago. In Fig. 1 can be seen a general view of the machine. This will give an excellent impression of the size and the method of construction, which has been to use spot-welded angle iron. The diagram shown in Fig. 2 indicates the mechanical movements, and a special feature is the incorporation of an extensive electronic timing system so that having pre-set the plant, it

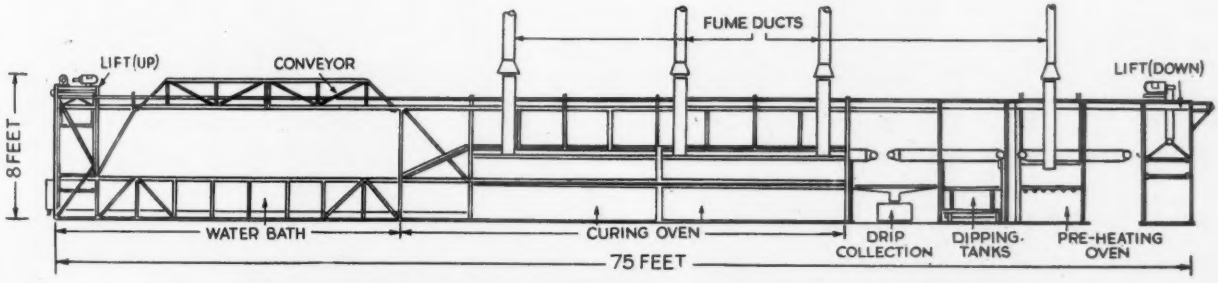


Fig. 2. A schematic diagram of the new machine, giving some idea of its size and method of working.

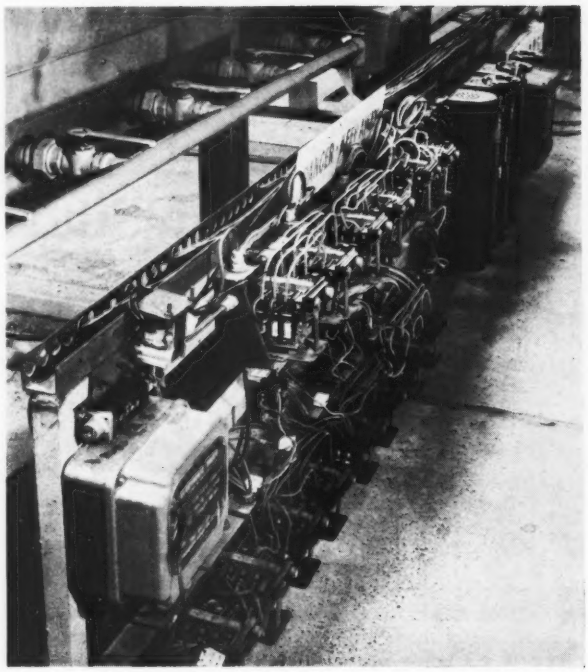


Fig. 3. Electronic control has made possible the automatic operation of this machine.

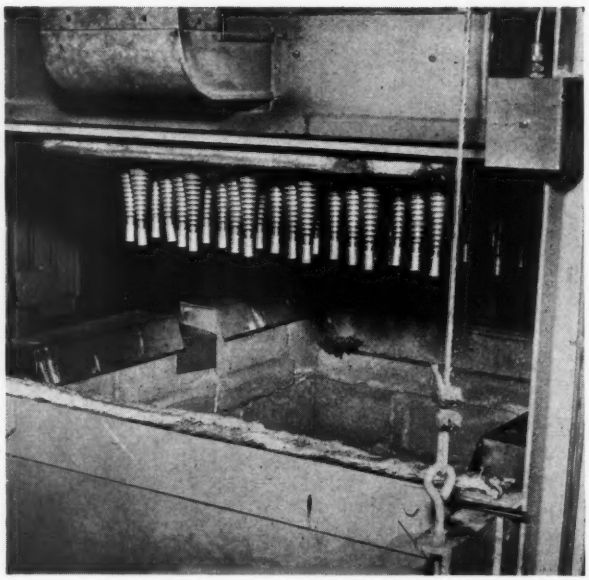


Fig. 4. The preheating oven rises up to enclose a rack of moulds. Here they will be heated to about 110° C.

can be left in charge of one operator. It cannot be emphasized too strongly here that the incorporation of electronic controls is not merely an effective method of saving labour, but contributes very considerably to a consistency of production. The covers have been removed from these controls and can be seen in Fig. 3.

The moulds are carried in racks on a continuous chain-link system and to commence the cycle they are brought into a preheating oven which is shown open in Fig. 4. The base of the oven rises automatically when the rack is brought to a standstill and it can be seen in Fig. 4 that moulds of different profiles can be run through at the same time. The preheating oven is set at 400° C. and when the moulds themselves reach a temperature of about 110° C. they leave the oven to the next phase where the racks move to a position over the p.v.c. solution tanks. The tanks, operated in the same way as the preheating oven, rise up and coat the moulds to a predetermined depth and for a predetermined time. These two factors, of course, influence the amount of p.v.c. retained by the moulds after extraction from the tanks. The other factor involved is the temperature of the moulds immediately prior to dipping. At the next stage, the racks move into the curing oven which is constructed of refractory bricks and is gas heated to a temperature of 160° C. This stage of the operation can be seen in Fig. 5. It takes approximately $3\frac{1}{2}$ minutes for a rack to move through the oven after which it emerges into a water bath, seen in Fig. 6. The mouldings are then stripped off the moulds and the racks are re-cycled over the top of the machine back to the starting point.

Production rates on very high levels can be reached, and one instance is 200,000 units per day for relatively low thickness, simple contours. Even for the more complex articles, where very considerably more material is to be picked up by each mould, the rates of production of this automatic machine

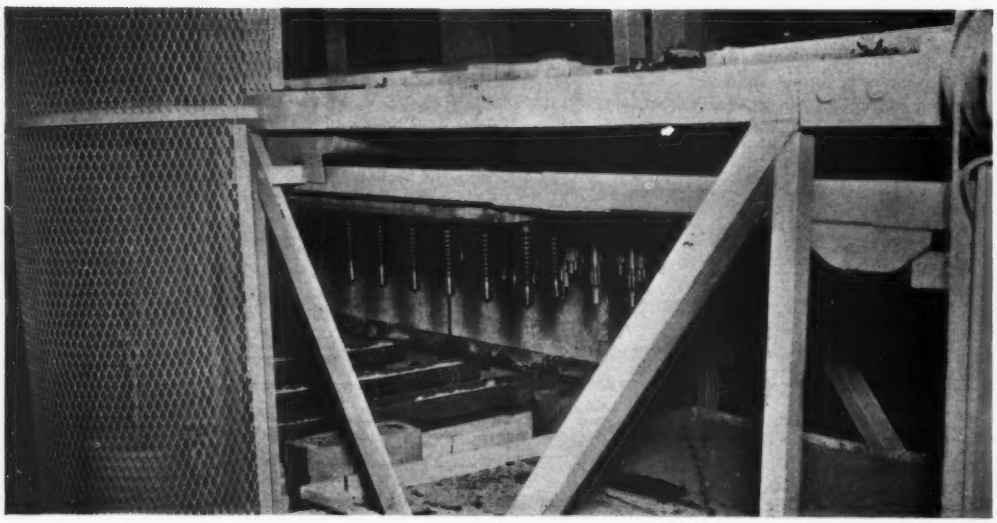


Fig. 5. The coated moulds, shown being preheated in Fig. 4 above, now enter the curing oven, which is gas heated to a temperature of about 160° C. Immediately the rack of moulds has cleared the entrance, the oven door automatically rises up to close the oven.

Fig. 6. At the other end of the oven, the racks pass into a water bath, where the moulds and mouldings cool sufficiently to be handled. After being stripped, the racks move to the end of the machine, are lifted vertically, and commence the cycle round the machine once again.

are very high and an interesting comparison can be made in productivity between this process and that of injection moulding.

The maximum cross-sectional thickness of any dip-moulded article is $\frac{3}{16}$ in., although normally the thickness is much below this, about $\frac{1}{16}$ in. Similarly, up to about $1\frac{1}{2}$ oz. of material can be taken up by each mould. The stripping of the moulds is at the moment carried out separately by hand but this aspect of production is also shortly to be the subject of an automatic plant. Due to close control, no finishing of the mouldings is called for.

The motive power for all stages is provided by nine electric D.C. geared fractional horse-power motors.

The main control is through the panel shown in Fig. 7. An interesting photograph (Fig. 8) shows this panel open and gives some idea of the complexity of the plant. Mould stores are shown in Fig. 9.

It is interesting to note that the machine was constructed in six months. The cooling water which is used on this machine and throughout the factory is actually rain water

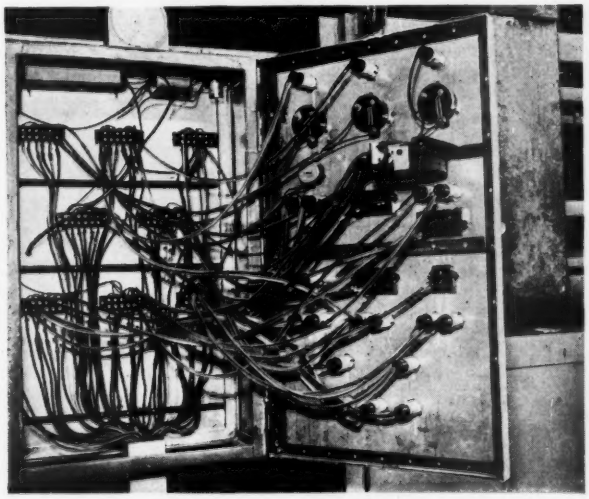


Fig. 8. The control panel shown open.

Fig. 7. Adjustment of timers on the main control panel.

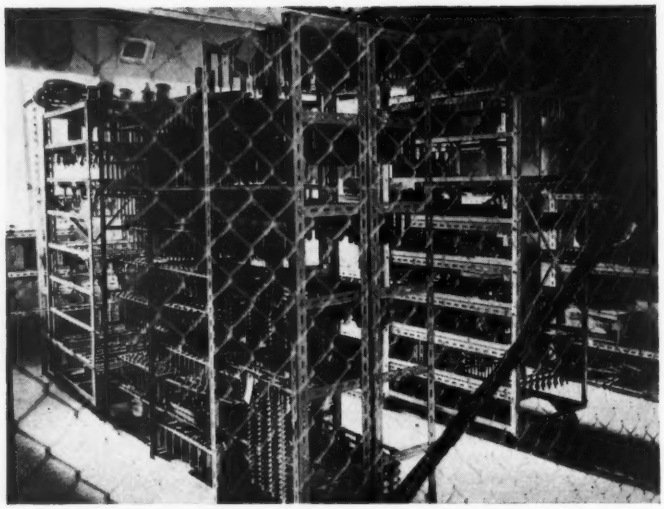


Fig. 9. Storing the moulds needed to maintain production on a machine of this capacity is a problem. Shown here is the solution, the wide-scale use of Dexion.

collected from the roofs of the plant, circulated throughout various machines and then re-cycled through tanks below ground where it is cooled.

Company Policy

The whole concept of production policy at this modern plant is virile and progressive, and affords great encouragement at a time when British industry is being assailed in many quarters for lack of inspiration and refusal to accept new techniques. This plant operates on a simple but challenging dictum; design and make any type of plastic unit to meet any purpose. All that is asked of a customer is to state his requirements, the rest being taken care of by the team of specialists, consultants and designers at the Creators plant. All necessary tooling is carried out on the spot in an extensive mould shop forming part of the works, while, if necessary, the company will build a complete machine to produce a particular type of extrusion or moulding. Moreover, all this is undertaken with a minimum of delay. Complete specifications for a new and perhaps unusual type of moulding or extrusion are supplied to a customer within hours, and a tool for the job can be designed and built inside a few days. In other words, to borrow a common term from the tailoring trade—Creators Ltd. are offering a "Bespoke" service in plastics to industry.

Conjointly, with automation and efficiency, this new-look plant in Surrey embodies all that is good in labour relations; each member of the staff is encouraged by bonus incentives and welfare facilities to give of his best, while the psychological effect of working in a streamline, spotless and bright factory is reflected in the high output and spirit of co-operation which exists throughout the organization.

The trade name under which Creators Ltd. market their products is "Plansel" and the company's managing director has certainly promulgated a vigorous "plan to sell," which could serve as a pattern in positive sales promotion in this era of increasing foreign competition.

In conclusion, we are grateful for the help we have received from Mr. A. C. Anselm, and from Mr. D. Hoffman, of Creators Ltd.

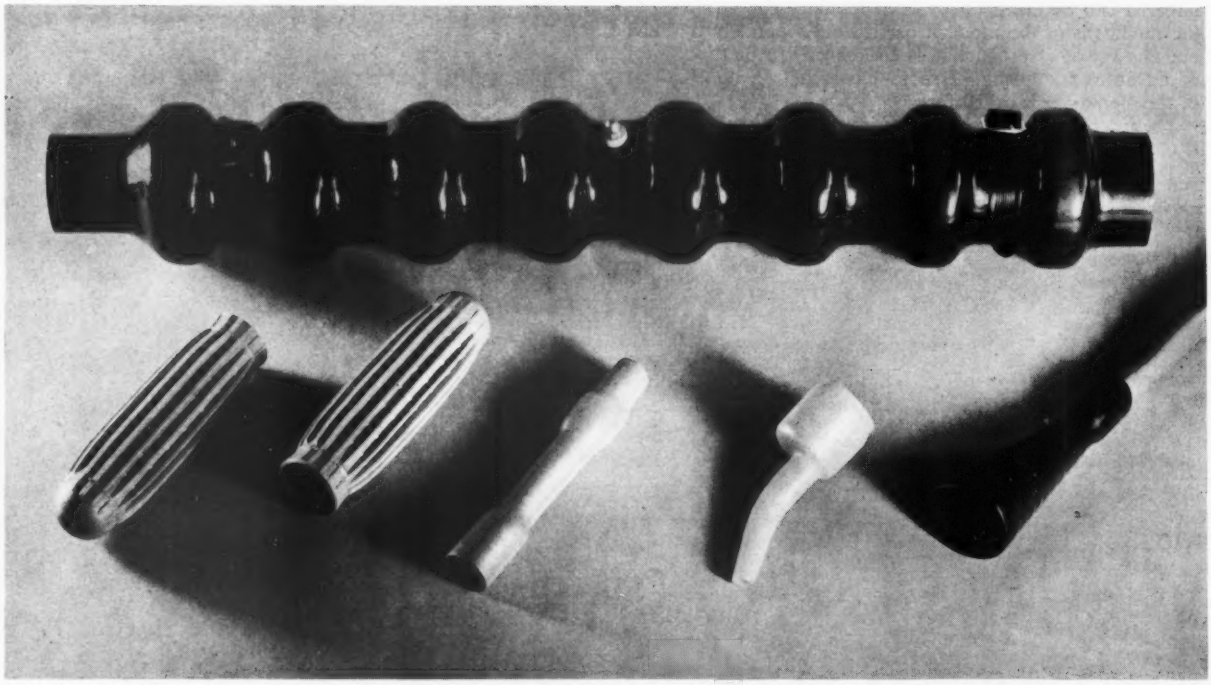


Fig. 10. Some of the typical products. Shown are spouts for taps, a washing-machine accessory, handle-bar grips, a pourer, and a large spring-protection gaiter.

Production Control

Details of a practical system now in use by Punfield and Barstow (Mouldings) Ltd.

Production control has frequently been discussed by all sections of the plastics industry, especially those dealing with moulding. Some of the problems, and the methods of solving them, are discussed here in the light of one company's experience.

IN proportion to its annual turnover, the plastics industry has probably had more books written about it than any other; particularly following the last war, a spate of publicity took place that seemingly saturated the market and one would imagine that every facet of the moulding industry had been discussed ad nauseam. Whilst it is true of course that progress in plastics is so rapid as to render the majority of textbooks out of date within a short space of time, nevertheless there is one vital aspect of the industry which has received remarkably little attention at the hands of the technical writer, namely production control.

In its simplest form, production control may be defined as getting the best possible results from plant available; how near the majority of moulding organizations get to this ideal state is of course anybody's guess, but we have always been specially concerned by the lack of published information on this subject, bearing in mind that the majority of other industries are able to point to an excellent record on the compilation of essential data in this respect. We have, for example, valuable textbooks on process control for industries as diverse as textiles and leather goods.

Special problems, of course, exist in the case of the plastics moulder, problems which tend to militate against the quick adoption of a satisfactory control system. Summarized, these problems include variations in raw material properties, a lack of uniformity in machinery available, an acute shortage of properly trained technicians and an unprecedented rise in output which has largely rendered every extension to a factory obsolete before completion. To live and work on a growth curve can be a stimulating experience, but the subsequent pressure upon available staff and plant very often makes impossible the proper re-organization of the company to keep pace with the over-strained production facilities.

One of the most effective control systems we have yet seen has been devised by the well-known injection moulding organization of Punfield and Barstow (Mouldings), Ltd. On first principles the company decided to devise a chart on which could be put all the essential information on any particular moulding, not only for the benefit of all departments concerned with that moulding, but also for future record purposes. It is not at all far-fetched to visualize, with the continually changing labour force in a moulding shop, a renewal contract for a job originally undertaken some three years ago. The wasted time that results from virtually starting from scratch with the project, since the original operator has left, is such as to put a serious brake on any production unit. That this takes place times without number is not in dispute, and it is a significant step forward to formulate a simple and easily worked system which can provide an answer to this problem. As will be seen in Fig. 1 below,

MOULD No. 497 RACK No. 16 No. OF IMPS. 2 CODE No. 1/373 EST. No. FRIEDLAND

MOULD DRG. No. M/599 PRESS SH.4 No.161 DESCRIPTION Case Unit

DRG. No. 887M MATL. SUPPLIER I.C.I. Ltd.

WT. OF ONE ARTICLE	.86 oz.	WT. OF ONE STALK	.08 oz.
WEIGHT PER 100 ARTICLES	5 lb. 6 oz.	WEIGHT PER 100 STALKS	8 oz.

MATERIAL: CLEAR DIAKON 011

MOULDING TEMPS.	COMPLETE CYCLE	TIMERS	REMARKS & MOULDING INFORMATION	MOULDING STANDARDS
Front 180°C. Rear 185°C Sunvic Set 80 front 85 rear	95	INJECTION SET AT 40	2 off 250 watt cartridge heaters in ejection half of mould. Mould temperature controlled simmerstat set at 3½. Mould temperature 70°C.	Reject for:- Dirty mouldings Short mouldings opposite side of feed. Cracks occurring at corners & change of section. Sinks on name & Push Button cavity Weld lines occurring on name plate.
	HOLD PRESSURE	DWELL SET AT 45	Brush very slightly with white oil button recess on both sides of mould. Pre-heat material for 2 hours at 250°F.	
LOCKING PRESSURE	WAIT		Important - Inject slowly for the first 15 secs.of injection period. This will obviate weld lines on the name plate.	
800 P.S.I				
INJECTION PRESSURE	EJECT & CLOSE			
1000 P.S.I	10		RATE	

1ST OP.	2ND OP.	3RD OP.	4TH OP.	5TH OP.	6TH OP.	REMARKS
On Press Drop into warm water 40°C removing after 9½ minutes (6 shots)	On Press Cut sprue with special knife heated to 200°C.	On Press Grind gate flush using fixture. Place into finishing tray.	Finishing Shop Inspection for dirt gauge .162" x .168" sq.hole gauge .067" dia.	Finishing Shop Buff with lustre at 2840 R.P.M. Polish with clean mop at 1425 R.P.M.	Finishing Shop Wipe clean and inspect.Pack 80 per carton wi with tissue between each layer using standard 9" carton.	

Fig. 1. A typical production control form used by Punfield and Barstow in their works.

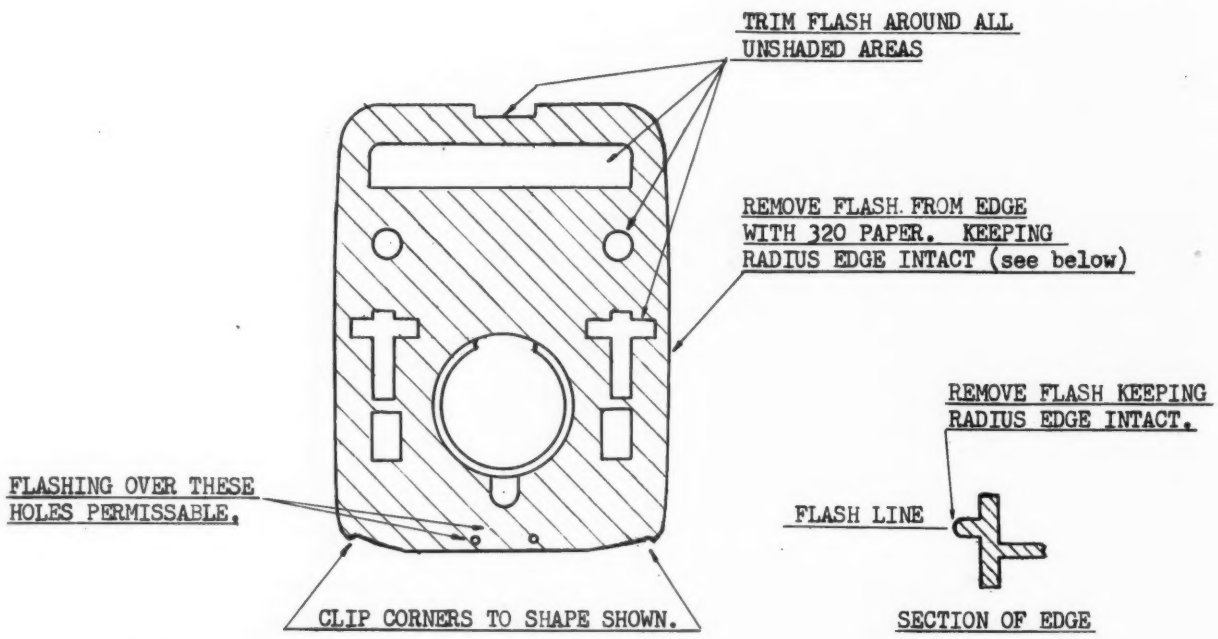


Fig. 2. Diagrammatic views of some mouldings are given on the reverse side of the form. These show clearly where special difficulties may arise. The drawing shown here is of a hearing aid component moulded in nylon.

a single sheet of paper contains all of the information that is necessary for the purposes of moulding, finishing and costing, any job undertaken by the company.

Mould Proving

For the benefit of those readers who are not fully conversant with moulding procedures, it may be as well to point out here that before any new tool is passed into production, a number of technicians spend a considerable amount of time installing the tool in the press in which it is to be operated and afterwards running the machine until the tool is giving the desired results. Occasionally a tool will work first time off, and immediately satisfactory moulding conditions can be established. More frequently, however, the arrival at satisfactory moulding conditions is a longer process, involving up to three or four weeks work before satisfactory results are being obtained. During the course of that time the tool may be taken out of the machine once or several times for modifications, and the machine itself will be run at widely varying temperatures and pressures until the optimum conditions have been reached.

During this period extensive and valuable information is obtained and Punfield and Barstow properly hold the view

Fig. 3. The moulding shown in Fig. 1. Diakon gives it a very solid appearance.

Fig. 4. Another Friedland component, moulded in polystyrene.

that because of the experience involved in its procurement, such information should be brought to the attention of those who will be later in need of it in the simplest possible way and should also be placed on record for future reference purposes.

Layout of Chart

First, on the form, is given the tool number and other essential data. The material to be used is specified and the weight of the article and of the scrap is noted to two places of decimals. Here it is pertinent to refer to the use of automatic weighing equipment when charging the press itself. Moulding temperatures are specified together with cycle times and general information on the moulding procedure is given under the heading "Remarks and Moulding Information." At the bottom of the form are separate columns for each operation. The first three concern the moulding shop or more specifically the press operator, the other three are the concern of the finishing shop. Under each of the operations specified it will be seen that the information is concise and explicit. Equally important, the directions to the staff on the subject of moulding standards are also specific. Customers of the plastics industry will appreciate the high standards towards which the industry is striving by taking due note of the heading under which any moulding should be rejected as unfit for use.

Copies of the form shown in Fig. 1 are enclosed in Cellophane envelopes and installed over the press, in the finishing shop, in the inspection department, and in the company's records. Each operator is supplied with a copy so that no difficulty need arise in correcting faults.

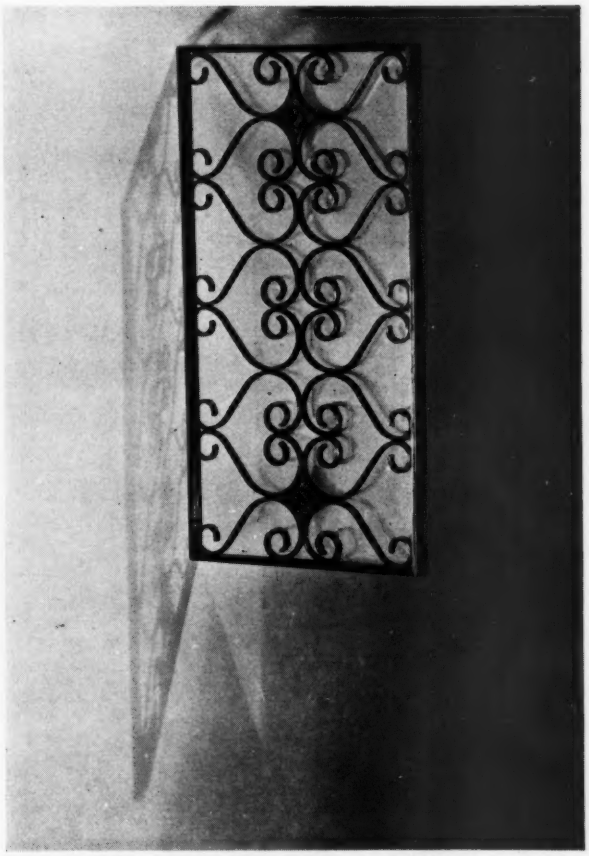


Fig. 5. This ornate grille is used in one of the bell systems. Injection moulded in black polystyrene.

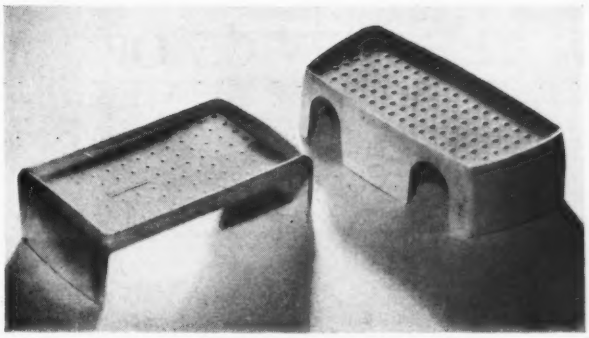


Fig. 6. Two styrene mouldings (pastel cream) for Friedland.

Shown in Fig. 3 is the moulding described in the control sheet. It has been carried out for V. and E. Friedland Ltd., of Macclesfield, Cheshire, and is an illuminated push-button unit for use with a domestic bell system. This actually is one of a series of mouldings shown in Figs. 4, 5 and 6 carried out by Punfield and Barstow for this company. In particular the press-button unit, shown in Fig. 3, is worthy of attention, being injection moulded in clear Diakon, and subsequently paint sprayed on the underside. Each of these mouldings is for a quality product, where good design and good finish are essential prerequisites. There is no doubt at all that the type of control system installed by Punfield and Barstow goes a long way to standardizing productions at this high level.

The sample we have illustrated was abstracted at random from the company's files and can therefore be regarded as typical. Although very much more complicated systems can and have been devised, with the normal moulding organizations typical of this country and America and elsewhere, this type of system seems to offer the greatest attraction. It must be understood that in some of the very largest organizations production control would only be possible with the aid of, for example, punch card systems, or similar elaborate measures. But the method described above has the outstanding virtue of taking full advantage of that unavoidable and costly work which takes place between the arrival of the tool and commencement of full-scale production. As an additional advantage it will of course serve in the mass to provide an invaluable store of information on press efficiencies, materials and tools. Until press standardization has become a feasible development, for example, the productivity of any one machine can be compared with that of another. Systematic analysis of all operations is made possible, again on a comparative basis. If we may refer here to the remarks made by Mr. Terry at the recent meeting of the Plastics Institute, when he was talking about injection moulding, he stressed the point that as far as possible work after leaving the press should be kept to the absolute minimum. Although this is axiomatic, much unnecessary work is still carried out in the finishing shops, and its extent can easily remain unnoticed unless a clear analysis of the situation can be quickly made. Every operation that takes place in the finishing shop is a matter of the greatest importance from the costs point of view. It is, therefore, very necessary that the collation of comparative information should be made as simply as possible so that each finishing operation can be studied with due care to make quite sure that it is absolutely essential.

Lastly, the fact that this information is available to every worker in the form of a simple chart is of outstanding importance. Not least it brings the operative into the confidence of its managerial staff, inducing a greater sense of individual responsibility.

PLASTICS
IN THE SERVICE OF MAN

A pictorial review of high-quality units moulded or otherwise fabricated in Great Britain . . .

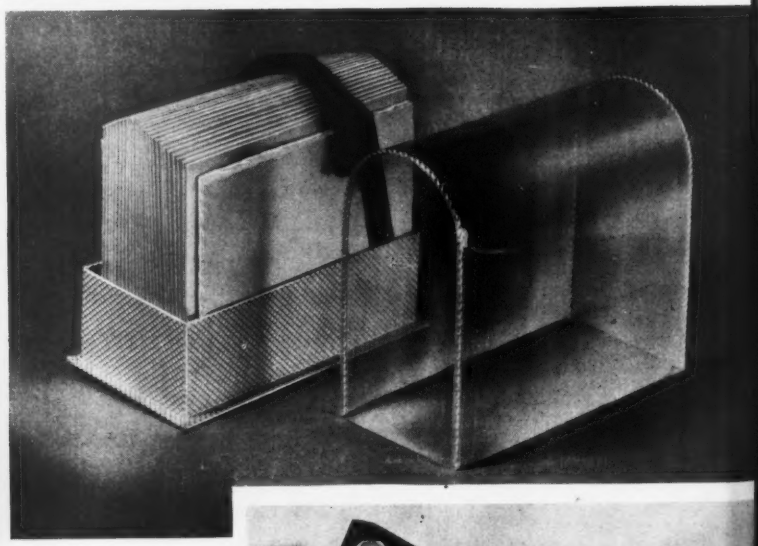
62. Christmas

A list of trade-marks and companies mentioned in this review, with full names and addresses, appears on page 428

(Above) Calendars moulded in polystyrene and spray metallized by Farringdon Metallic Finishes Ltd. make an inexpensive and attractive gift.

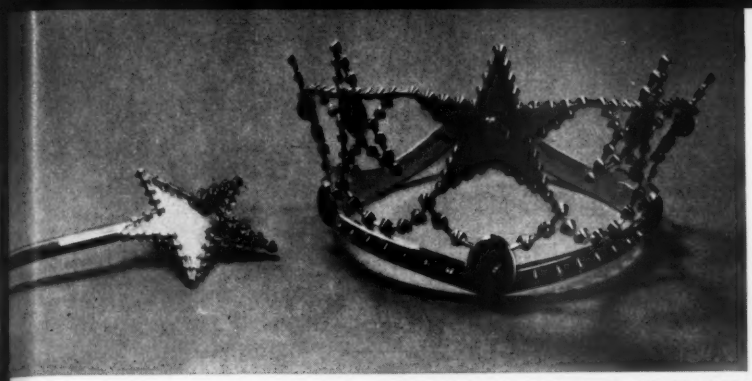
(Left) Ship models made up from injection moulded polystyrene construction kits produced by Airfix Products Ltd.—one way of keeping the youngsters quiet!

(Right) Always acceptable, "My Lady's Own" envelopes and correspondence cards in an acetate pack with gold cord beading produced by John Dickinson and Co., Ltd.



(Below) Yule tree, injection moulded in polystyrene by Witton Moulded Insulation Works of G.E.C. Ltd., for the Noma Electric Co., Ltd. The tree is moulded in two parts, the red berries being attached later. The detachable base is also moulded in red polystyrene. The whole is illuminated from inside with a 15-watt pygmy lamp.

(Right) The cracker contains three shampoo sachets made by Robinson Waxed Paper Company from reverse printed Clarifoil laminated to Pliofilm. The candy pack made by F. T. Pillivant Ltd. uses Clarifoil for the window.

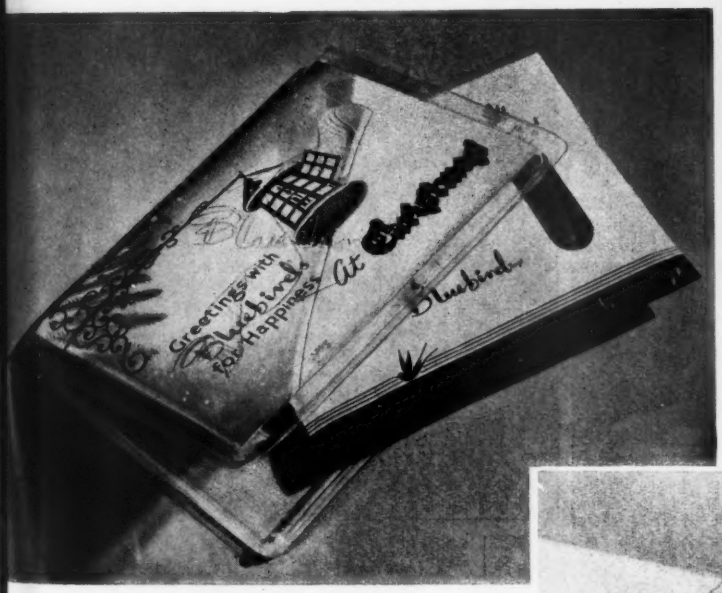


(Above) A fairy headdress and wand moulded in cellulose acetate and polystyrene and metallized by J. F. Kenure Ltd., for Cecil Coleman Ltd. All that glitters . . . .

(Right) "Queen of the Ice" perfume container for Potter and Moore produced by The International Bottle Co., Ltd., with the figure and stopper moulded in cellulose acetate by Punfield and Barstow (Mouldings) Ltd., and afterwards metallized.

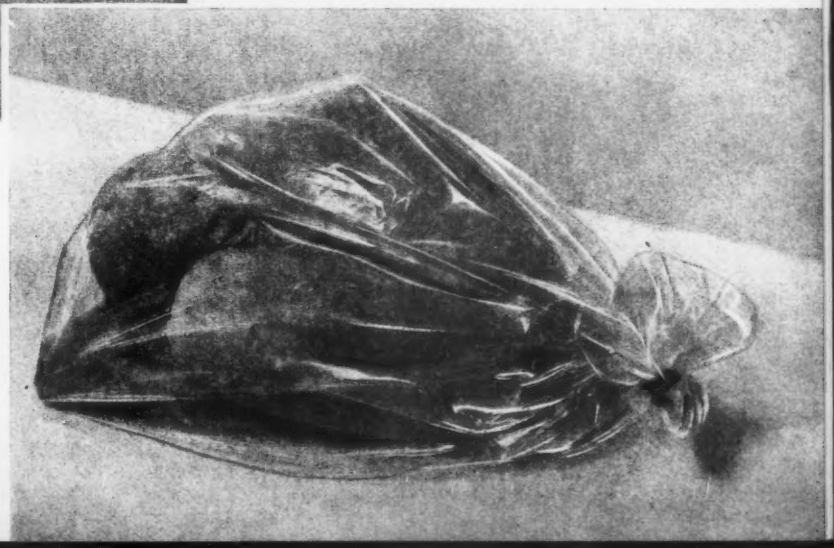
(Below) It will probably disturb your afternoon nap but will provide enjoyment for the youngsters. A realistic model of an automatic carbine moulded in polystyrene by Rosedale Associated Manufacturers Ltd. The bayonet blade is moulded from polythene.

(Above) Santa is lit up! Injection moulded in white polystyrene by the Witton Moulded Insulation Works of G.E.C. for the Noma Electric Co., Ltd., the figure is flock sprayed and illuminated internally.



(Above) Christmas stocking pack vacuum-formed from Cellastine acetate and designed and produced by Hargill Ltd.

(Right) Your Christmas dinner may be packed in polythene. The bag is supplied by Spesco (Developments) Ltd. Please remove before cooking.

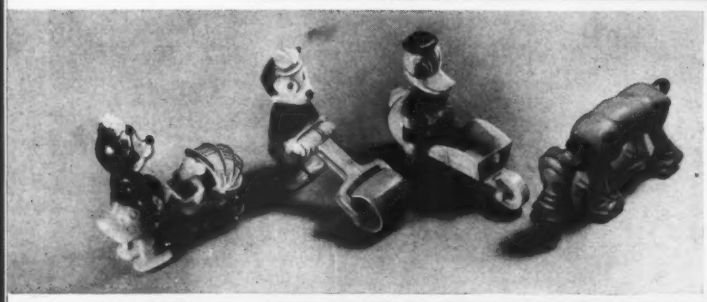


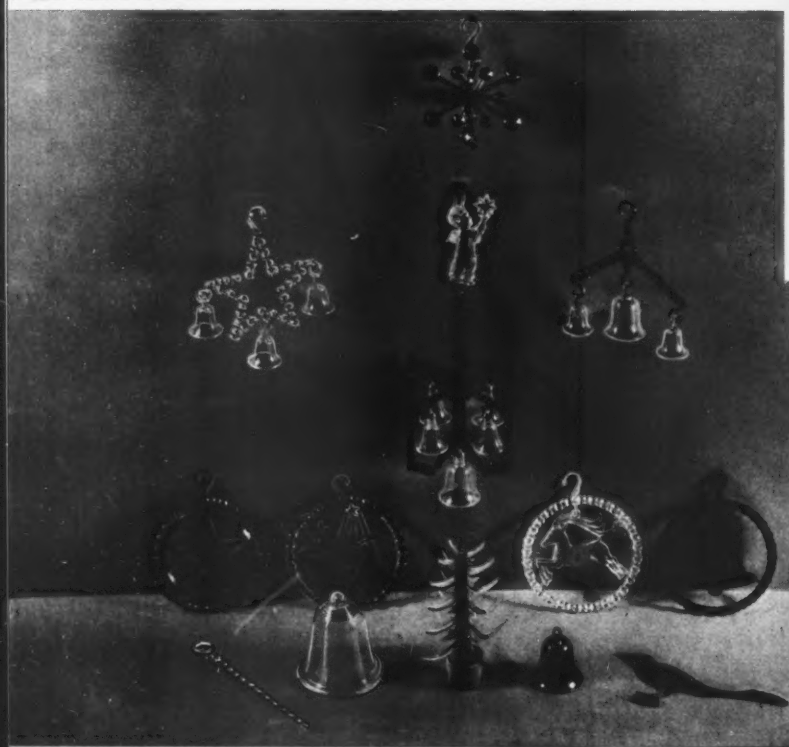
(Left) A kiddi es' tea set moulded in polythene by Airfix Products Ltd., should last them a long time without breakage.

(Above) !Festive star lights will add colour to your decorations. The stars are moulded in two parts from urea and the lamp holders from phenolic material, by the Witton Moulded Insulation Works of the G.E.C.

Below) These walking Disney figures are novel and will easily go into a stocking. Moulded in polystyrene by J. F. Kenure, Ltd., for Louis Marx and Co., Ltd.

(Left) This Duchess Set will provide an attractive present. Manufactured by Halex in pastel pearl shades of polystyrene.



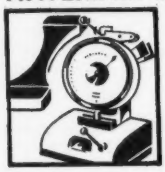


(Above) Musical box candle holders which slowly revolve to different tunes. Moulded in polystyrene by Injection Moulders Ltd., for Schall Products, Ltd. The musical movements are of Swiss manufacture.

(Left) Christmas tree decorations in many bright colours (not shown here) are being moulded in polystyrene by Rosedale Associated Manufacturers Ltd.

World's Industry Employs Plastics

MATERIALS and TESTING



Glass fibre reinforcement. — Characteristics and applications of glass reinforcements: chopped strands, continuous strands (roving), non-woven mat held together by stitching or adhesives, milled fibres, etc., are discussed from point of view of strength and cost.
(*SAE Preprint*, Summer Meeting, June 12-17, 1955.)

Glass fibre reinforced polyester resins.—H. Lutz and R. Bock give a general survey of these plastics, which are important owing to their ease of fabrication and good mechanical properties.
(*VDI-Zeits.*, 1955/Oct. 1/970.)

Properties of glass fibre polyester resins.—Review by H. Sauer on applications for aircraft, motorcar bodies, boats, etc.
(*Industrie-Anzeiger*, 1955/Sept. 30/1121.)

Precondensation of epoxy-resins.—P. Bruin describes a method to improve flow and film-forming characteristics of surface coatings from epoxy-resins. The final curing reaction takes place partly during coating.
(*Kunststoffe*, 1955/Sept./383.)

Systematic survey on high polymers.—O. Leuchs continues his survey and tabulates the pure high polymers, and also gives an alphabetical index and German trade names.
(*Kunststoffe*, 1955/Sept./375.)

Electric insulating resins.—The use of modern resins reduces the size of American electric motors.
(*Chemical Week*, 1955/No. 21/105.)

Polyvinyl chloride.—W. Schmitz gives a survey of the uses of this plastic in chemical apparatus and for pipe installations owing to its good welding properties.
(*Industrie-Kurier* (*Technik and Fortschritt*), 1955/Oct. 12/421.)

Irreversible heat behaviour of organic insulators.—Insufficient information is yet available on heat resistance of modern insulating materials. It is necessary to develop testing methods which may give general recommendations for fixing temperature limits for practical uses.
(*Kunststoffe*, 1955/Sept./367.)

PROCESSES : MACHINERY

Plastic surfaces for plating rolls. — Rolls covered with thermosetting laminated plastics have reduced considerably losses in tinplate rolling. A special fabric with resin treatment stood up to the stringent operating conditions.
(*Design News*, 1955/Sept. 1/38.)

Hydraulic presses for plastics.—New design developments in plastic presses and their pump drives.
(*Maschinenbautechnik*, 1955/Sept./472.)

Handling and machining of plastics.—J. Delorme gives a survey of the methods of cutting, shaping, sawing and machining of plastics. The forms of suitable twist drills and rotary engraving tools are shown.
(*Revue Générale de Mécanique*, 1955/Sept./312.)

Problems in design of moulded plastics.—H. Kotthaus gives recommendations with regard to the design of plastics components.
(*Industrie-Anzeiger*, 1955/Sept. 30/1117.)

Welding of plastics.—A general survey is given of the present development in the welding of plastics. The methods are discussed in the following groups: hot-air or hot-gas welding, welding by contact with heated tools, high-frequency welding, friction welding and flame welding.
(*Technica* (*Berne*), 1955/Oct. 14/129.)

Sorting of insulating washers.—A new machine by Automatic Telephone and Electric Co., Liverpool, sorts automatically phenol-resin washers in groups according to their thickness.
(*Electronics*, 1955/May/156.)

INDUSTRIAL APPLICATIONS

Teflon sleeves for interchangeable glass joints. — Thin-walled (0.003 in. thick) hollow truncated cores with accurate tapers fit snugly over standard ground-glass cones to form a vacuum-tight joint without using grease. No risk of contamination; resistant to temperatures from −75° to 300° C.
(*Laboratory*, 1955/Oct./432).

Fixing of plastic bushes.—A. Keil gives a survey of the possibilities of covering cylindrical metal parts with thermoplastic and thermosetting resins, serving as protection against corrosion, or for sleeve bearings. Detailed recommendations are given.
(*Maschinenbautechnik*, 1955/Sept./467.)

Nylon in precision engineering.—In order to use these materials correctly, properties and production conditions must be known. Correctly shaped parts have a long life and when large numbers are required they are cheaper and of lower weight than metal components.
(*VDI-Zeits.*, 1955/Sept. 21/962; *VDI-Berichte*, 1955/Vol. 2/55.)

Nylon as a gear material.—K. Maylahn draws attention to the polyamides as structural materials for gears; their special advantages are noise damping, resistance to abrasion, low coefficient of friction, low specific gravity and high strength. Properties are given in the form of diagrams and tables.
(*Werkstatt and Betrieb*, 1955/Oct./647.)

Jigs and fixtures of plastics.—Epoxy plastics give stable, durable and cheap fixtures and tools, and can keep tolerances. Recommendations of Furance Plastics Inc., Los Angeles.
(*Aero Digest*, 1955/April/48.)

Embedding technique.—R. C. Fox describes the embedding technique for a three-tube plug-in unit of Westinghouse Electric Corp., using a silicone cast resin.
(*Electronics*, 1955/May/250.)

Requirements for miners' safety helmets in plastics.—In August, 1955, a German Standard DIN 23 313 for a miner's helmet of plastics was issued, which gives detailed data on the helmet body, interior fittings, fracture strength, penetration strength in wet and dry condition, inflammability, electrical resistance and wear.
(*Kompass*, 1955/Sept./93.)

MISCELLANEOUS USES

Competition between plastics and metal.—The development of the use of plastic components in various industries also employing at the same time metals is compared, such as the production of packaging and wrapping media, tubes, household articles, etc. It is stated that there is not merely competition between plastics and metals, but in many cases plastics are to be considered as a valuable addition to metals, and the combination of both will bring big possibilities in the future.
(*Metall*, 1955/Oct./899.)

Thermosetting plastics for replacing metals in marine engineering.—Thermosetting plastics replace metals in the production of many components and give smoother surfaces, less joints, better corrosion resistance and easier production. Piping, safety helmets, fuel-storage tanks, radar aerials and many other products are now made from plastics.
(*Design News*, 1955/Sept. 15/130.)

Quality problems.—E. Mollberg discusses the important statement: each plastic article which comes on the market of a low quality produces, even if it disappears in a short time, thousands of unsatisfied customers and ultimately shatters the confidence in plastics of these customers. Ways to avoid this are clearly indicated.
(*Industrie-Anzeiger*, 1955/Sept. 30/1118.)

Origin and application of plastics.—H. Saechtling gives a general survey of origin of plastics, their production and application for many industrial processes.
(*Industrie-Anzeiger*, 1955/Sept. 30/1113.)

World production of plastics.—R. Rohm gives a general survey of the development of the plastics industry.
(*Industrie-Kurier* (*Technik and Fortschritt*), 1955/Oct. 12/419.)

Plastics Aid Residual Products Conversion

BY THOMAS A. DICKINSON

Waste products, such as leather dust and wood flour, are being put to good use with the aid of certain plastics. This article, written in America, describes some typical methods of making and using "reclamation plastics".

RECLAMATION plastics can be briefly described as binding media which make it possible to reunite scrap materials such as leather dust and wood flour for use as substances that are not fundamentally plastics. They should not be confused with filled plastics, in which scrap materials usually serve as bulking agents or cheapeners.

They are attaining considerable prominence in the United States at present by virtue of their ability to increase the market for the output of plastic fabricators, and their use is not confined to those localities where large quantities of scrap are accumulated by basic industries.

Every sizeable community has factories that produce scrap; and, while the output of a given type of scrap in any one factory may be small, the fabricator who is in a position to reclaim scrap from several shops can to a great extent function as a basic material producer.

For example, one American moulding company now reclaims scrap which is produced by a number of small firms manufacturing luggage, shoes, and other leather articles in the immediate vicinity. This concern gets the scrap for almost nothing, since the leather manufacturers would otherwise have to pay to have it hauled away, and is earning excellent profits by reselling the scrap as a reclaimed sheet material which closely resembles tanned hides at a cost which is appreciably less than the price now being paid for hides.

Virtually all organic resins have certain potentialities as reclamation plastics. However, only three general types are currently known to have any appreciable number of practical applications in the reclamation field. They include phenolic and urea thermosets; synthetic elastomeric thermoplasts, such as nitrile rubber and polyisobutylene polymers; and natural elastomers such as hevea and castilloa rubbers.

The trick in using these resins as reclamation plastics consists briefly of combining such a small quantity of binder with such a large quantity of scrap that the inherent properties of the latter material will prevail in the end product. In fact, some materials now being reclaimed with plastics comprise less than 10 parts binder and more than 90 parts scrap by weight.

To indicate precisely how a small quantity of resin can be used to reclaim a large quantity of scrap, it is necessary to describe some specific procedures under the headings that follow.

Wood Reclamation Method

One of the more practical processes for the reclamation of wood scrap is now in use at the Forestrong Company, at Gardena, California. It permits the production of mouldings that are physically and chemically equivalent to the best wood turnings at a fraction of the latter's cost.

It differs from older wood-reclamation processes to the extent that it can be used to rebond relatively long cellulose fibres as well as sawdust or flour-type materials. This is advantageous because:

(1) Most wood scraps can be converted into cellulose fibres for less money than is required to produce wood flour.

(2) Raw material costs are reduced, because fibres can be rebonded with smaller quantities of adhesives than powder particles (due to the fact that the fibres retain much of their natural structural integrity, while the powders must be comprehensively reunited). For example, where 80 parts of wood flour would have to be mixed with at least 20 parts of resin in order to produce usable mouldings, 100 parts of wood fibre can be satisfactorily mixed with only three parts of resin (by weight).

(3) Fibres tend to reinforce resinous binders.

(4) "Resinated" wood fibres can be moulded without producing substantial quantities of scrap, because their flow properties (when they are subjected to heat and pressure) are insignificant.

A simple mechanical crushing operation makes it possible to convert both hard and soft wood scraps into short thread-like fibres, after which the fibres are individually and collectively coated with resinous films of microscopic thickness by pneumatically ejecting them through an aerosol.

The aerosol is produced by using a device analogous to a paint spray gun to permeate the atmosphere of an appropriate coating chamber with a resinous mist. Phenolics are the most commonly used resins in this operation.

The coated materials are next allowed to dry without becoming bonded or strongly adhered to one another. Then, because of their low flow properties, the materials are preformed. This involves briefly the use of pneumatic pressures of 200 to 1,000 p.s.i. and temperatures of 70 to 250° F. to compress the materials to the approximate shapes of various mouldings.

The preforms, in turn, are converted into strong, solid mouldings by loading them in steel mould cavities and using temperatures of 300 to 400° F. with compressive forces of 1,000 to 2,000 p.s.i. to fuse and bond the resinous coatings on the fibres. This usually requires a moulding cycle of one to three minutes.

Mouldings thus produced could have a permanent, built-in finish if pigments were incorporated in their resinous binders prior to preforming. But since pigmentation would increase raw material costs by

Wood scraps, reunited by plastics in compression mouldings, look like first-quality turnings; but, in many respects, they are actually better than wood turnings.

necessitating the use of extra quantities of resin, Forestrong officials believe it is cheaper to have their mouldings finished like conventional wood products which they closely resemble.

The raw material cost of Forestrong mouldings at this writing is estimated to be about 10 cents per lb. Conventional mouldings made with most resins and fillers now have an average raw material cost of about 85 cents per lb.

Many of the mouldings produced by Forestrong require no subsequent machining, since they have all the details that are essential to their use in the "as-moulded" condition. However, some are produced as standard materials which can be further processed by other firms.

The latter materials can be sawed, sanded, planed, shaped, drilled, etc., like fine grades of hardwood. Also, they can be assembled with nails—a procedure that would cause most plastics mouldings to crack. The springback of the materials is such that nail heads can be countersunk in their surfaces with nothing other than an ordinary hammer without producing unsightly dents or scars.

Unfinished Forestrong mouldings will absorb some moisture, but not as much as wood due to their low porosity. They are not as porous as wood because fibre constituents can be more tightly compressed by modern hydraulic press equipment than they are by mother nature.

The close union of wood fibres in Forestrong products also explains why they can have more mechanical strength than natural wood materials, since top strength in either case depends on which substance has the most wood fibres in each inch or fractional inch of its cross-sectional thickness.

Typical products that have been made by moulding wood fibres include chair backs and seats, weight-relieved core boards, cabinet and slab doors, flooring, glass frames, brush and tool handles, appliance housings, printing plate blocks, tote boxes, and hardboard.

Resin bonded wood fibres being moulded at the Forestrong Co., California.

Electrostatic Method

An electrostatic coating process developed at Battelle Memorial Institute, Columbus, Ohio, permits the efficient use of thermoplasts in the reclamation of such materials as cotton flock, mica particles, and metallic powders by applying the latter as coatings to continuous rolls of paper, fabric, resinous films, etc.

The principle used in the process is basically the same as that used in an electrostatic precipitator. The coating material, which comprises scrap and resinous powders, is suspended as dust in air so that it can be electrically charged and deposited with strong electrostatic fields.

This work is done on a fully automatic basis in a closed chamber, and coatings of 3 to 20 pounds (basis 25 by 38-500) have been deposited on webs moving at rates up to 100 ft. per minute.

Because the electrostatic adhesion of coating materials and deposition surfaces is only temporary, heat and/or pressure must subsequently be used if permanent bonds are required. Sheets of considerable thickness can be produced, if necessary, by laminating several layers of stock thus coated.

Materials suitable for use in connection with this process must have particle sizes of the order of 5 to 10 microns, and may comprise about 60 to 80 parts scrap by weight.

Besides eliminating the need for the volatile solvents that are commonly used in applying organic finishes, the electrostatic coating method has the advantage of allowing a great amount of work to be done in a relatively small amount of plant space and with very little labour.

Electrostatic processing reclaims cotton flock, mica particles, etc.

Solvent Dispersion Method

A solvent dispersion technique, now used by several firms in the reclamation of leather dust (a by-product of buffing and sueding wheels used in the manufacture of leather products), has the advantage of being practical for plastics fabricators with no special reclamation facilities.

It consists, briefly, of dissolving a resinous binder (usually a thermoplastic elastomer) in a large quantity of volatile solvent, and then adding scrap to the mixture. Up to 90 parts scrap can, by weight, be dispersed in 10 parts resin if enough solvent is used.

The solution may be used on porous surfaces as a permanent organic coating. However, the usual procedure is to apply it as a strip coating to a polished glass or metal surface.

When its solvent contents have evaporated, the strip coating may be removed from its deposition surface and then laminated to other films produced in the same way; or it may be shredded for use as a moulding material.

Polyisobutylene polymers with small molecular particles generally yield reclaimed leathers with the best properties.

Typical products being made with solvent-reclaimed leathers include shoe soles, packings and gaskets, friction belts, and upholstery. Such products are most economically produced with moulding equipment. However, sheets of reclaimed leather may be processed with the same facilities that are used in fabricating natural leather products.

Petrochemical Survey

By JOSEPH G. DAVIDSON

Vice-President of Union Carbide and Carbon Corporation, Dr. Davidson has seen remarkable developments in the world of synthetics down the years. The following extracts have been taken from his anecdotal address to the American Section of the Society of Chemical Industry, in October, when he was presented with the Chemical Industry Medal, "for conspicuous services to Applied Chemistry".

"IN looking back over the past 35 years, I am amazed at the growth of what has come to be known as the petrochemical industry in the United States.

"The growth was sudden—almost explosive. Prior to the 1920s, we had in the United States an organic chemical industry but it was small. The total sale of chemicals that we would now include in that category amounted to only 14,000,000 pounds as against 3.2 billion pounds at the present time. Furthermore, many of the chemicals, such as acetone, acetic acid and methanol, were made by processes that did not even faintly resemble the present processes. I need hardly stop to say that at that time these three products were produced by the destructive distillation of wood, the by-product and sometimes the main product being charcoal. You might almost say that any similarity to names, places or compounds, living or dead, was purely coincidental.

"On the other hand, this situation is not so strange as it at first seems because the raw materials from which our present-day petrochemicals are produced were not then available. I am referring primarily to ethylene and propylene. It seems to me to be a fact which is totally documented in the present instance that an industry will develop with a speed that is pretty much proportional to the availability, suitability and excellence of the tools with which it has to work.

"To step outside of our industry for a moment, the production of automobiles as we know it today would be impossible if it still had to rely upon the tools, jigs, fixtures and methods of the 1920s. Another illustration, this time in our own industry, has to do with the development of the aromatic division of organic chemistry, in which until the close of the First World War and for some time afterward, Germany clearly had the lead. Although the by-product coking of coal and the initial use of some of the chemicals derived from this process was first developed in England by Perkins, *et al.*, it reached its greatest development in the hands of the Germans, who needed the coke for their steel furnaces. But Germany was a relatively small and densely populated country and it was, therefore, impossible to let the smoke of the beehive coke ovens pollute the atmosphere or permit the residual liquid products to be run into the rivers, as was true in certain sections of New York and Pennsylvania, during the early days.

"The Germans, therefore, set about finding uses for these by-products, benzene, toluene, naphthalene, etc., and with these tools, they built a great aromatic chemical industry.

"Carbide and Carbon Chemicals Corporation was chartered on October 8, 1920, as a subsidiary of Union Carbide and Carbon Corporation, but prior to that date, Dr. G. O. Curme and his co-workers had carried on, since 1914, a considerable amount of research work having to do with the utilization of ethylene and acetylene. The ethylene was produced by the pyrolysis of a component of natural gas, namely, ethane, and this really was the first step of the beginning of this huge petrochemical industry.

"There was a great deal of ignorance at that time with respect to the actual components of natural gas. Analytical methods were extremely cumbersome, involving usually a combustion analysis. If the gas happened to be pure methane, the analysis worked out fairly well, but if the gas also contained ethane and propane, the results of the analysis were largely conjecture and I can clearly remember during my college days one of the books I had occasion to refer to gave a table of the components of various natural gases and listed ethylene itself as one of the constituents, which we now know to be impossible.

"We separated the ethane from the natural gas by liquefaction and distillation at very low temperatures, utilizing the Linde method as worked out by another division of the Union Carbide Corporation. Propane was isolated in the same way and these two pure compounds were then separately cracked or pyrolyzed to yield ethylene and propylene. With these two reactive products available now for the first time in commercial quantities and at a reasonable cost, we had the tools with which to begin to build a new industry. . . .

"We now come to the story of Vinylite. That started in a curious way also. At that time, tung oil was used very extensively in varnishes because the varnishes so made would dry hard and would not turn white when boiling water was spilled over them. However, the supply of tung oil was erratic, the price was variable and, in addition to that, people working with it were subject to a rather severe skin disease. So, one time when I was discussing the situation with a salesman for a varnish company, he asked why shouldn't it be possible to make a synthetic tung oil. That started a train of thought that caused me to look up the composition of tung oil and, sure enough, I found it contained a number of vinyl groups.

"Well then, I looked up the literature and found that vinyl chloride could be produced from ethylene dichloride of which we had a super-abundant supply at the time. It could also be made from hydrochloric acid and acetylene of which we also had a plentiful supply. So, we made some vinyl chloride and polymerized it. We got a white solid that could be formed into objects, but our first experiments were very disheartening. A plaque of Vinylite put on the roof and exposed to the sun would turn jet black in an hour or so and become as brittle as a thin piece of charcoal. It was a long time before we learned how to incorporate plasticizers and produce a copolymer of vinyl chloride and vinyl acetate, which was the first product we called Vinylite.

"Just as so often happens, we tried to substitute it for known resins, Bakelite phenolics, for example, but in comparison with these, it was no good at all.

"However, about that time somebody had the bright idea of moulding toothbrush handles from it so we bought a few injection-moulding machines and moulded up thousands of toothbrush handles. Here, we were within fingertip reach of success but the toothbrush handles were found to be lacking in one respect. As you probably know, the tufts of bristles are inserted as a part of a high-speed drilling operation and the Vinylite resin softened to the point where it gummed up the drills and slowed down production; therefore, Vinylite was unacceptable because it took longer to process even though when you finished you had a good toothbrush handle.

"Thinking of teeth, of course, brought us in contact with the dental people and for a time we supplied Vinylite resin plaques for the manufacture of dentures for false teeth. This was an excellent business for although the volume was small, the price was excellent, something like $5.00 a pound. But here again, we ran into difficulties.

"In 95% of the cases, the vinyl dentures worked out

perfectly and were far superior to the materials that previously had been used but, in the case of people who had a high roof to their mouths, a high palatal surface it was called in the dental surgeon's lingo, the vinyl denture would flex a little at each closing of the jaws and finally, through fatigue, would crack right down in the middle, and curiously enough these dentures always seemed to pick out the most embarrassing moments to split. I remember one time when our good old friend Charlie Parsons was making a speech. He became so enthusiastic that he gritted his teeth and at that precise moment his denture split right down the middle and, since he had no spare with him, that was the end of the speech.

"After all these difficulties in getting started, we finally found ourselves in business. Vinylite raincoats came along next, then Vinylite records, sheeting, then insulation for electric wires and cables, then Vinylite inflated toys and equipment and finally, after we had proven the product, competition reared its ugly head. All of the rubber companies, one by one, went into the manufacture of vinyl resins of one type or another, then other companies followed them, until as an actual matter of fact, there are today nine companies manufacturing vinyl resins in one form or another and that does not include the firms that only compound or fabricate the product. But the interesting fact is that production has now reached the astonishing total of 550,000,000 pounds per year and is still growing very rapidly.

"We next come to polyethylene. This was a war-time product. The Imperial Chemical Industries of England were the ones who first discovered and patented the process for polymerizing ethylene. They in turn licensed the process to the du Pont Company. About this time, we found we had some high-pressure equipment standing idle and did some experimenting of our own with ethylene and found we could produce polyethylene by a somewhat different process but one still subject to the I.C.I. patent. During the war we were asked, along with the du Pont Company, to produce polyethylene, primarily for radar cables. Just in case you do not remember, radar cables were cables that ran up the mast of a ship, encased in a tube containing a gaseous dielectric, such as nitrogen or air. An exploding shell nearby—even the firing of the ship's own guns—often shattered the tube and rendered the radar inoperative. Polyethylene was found to have the dielectric properties needed but in solid form and was thereafter used as insulation for the radar cables.

"We finally obtained a sub-licence from the du Pont Company although as I said before, our process was somewhat different from theirs. We used very considerably higher pressures, amounting to as much as 30,000 pounds per square inch and, in the initial phase of our experiments, we consumed more pounds of steel than we made pounds of polyethylene. By this I mean that we wrecked more pounds of pumps, primarily pump cylinders and pistons, than we produced polyethylene but little by little, these difficulties were overcome.

"After the war, the use of polyethylene began to grow enormously. It was found to be superior to all other materials for insulating high-frequency electric wires and cables. Polyethylene sheeting was used to make bags for use in the deepfreeze, for sealing equipment against moisture and finally pipe—both flexible pipe and rigid pipe—began to be manufactured from polyethylene and the market has continued to grow enormously. The termination of the Government's suit against Imperial Chemical Industries and du Pont made licences available to all under reasonable terms and there are now seven firms manufacturing approximately 350,000,000 pounds of polyethylene per year in the United States and this does not take into account all the firms compounding or fabricating the polyethylene nor the additional firms that have taken out licences and are building plants. Within a few years, however, the producers will number at least 12 and the capacity will be 800,000,000 pounds per year.

"And now to complicate the picture still more, two new processes have been developed, one in Germany and one in the United States, which produce a somewhat different variety of polyethylene. One of these, the Ziegler Process, operates at atmospheric pressure while the Phillips Petroleum Process uses moderate pressures of 250 to 500 pounds. The variety of polyethylene produced by these processes will stand considerably higher temperatures without deformation than the older type but we believe they will be somewhat more expensive to make.

"Each variety of polyethylene will find a market, I am sure, and the older high-pressure type will hold its position, I feel certain, because it will be cheaper and for all of the uses for which higher softening points are not required it will serve every bit as well and possibly better than the new varieties. Again, this illustration shows that in our industry nothing is ever quiescent for long. Just as soon as somebody produces a new and interesting material, somebody else starts out to improve its properties or work out different methods of making it. Competition, I am quite convinced, is a good thing. It keeps you on your toes and makes you work as hard as, or harder than, your competitors to improve your products or processes. In the case of polyethylene, none of the producers of the high-pressure product thought of the new or low-pressure processes. On the other hand, the inventors of the two new processes did not start out to make polyethylene. They were looking for other things but they were smart enough, both of them, to recognize the adaptability of their process to the production of polyethylene. So, now we have more competition and I welcome it. In the end, it will be good for the product, for us and for you, the final consumer."

AN ELECTRIC CUTTING SAW FOR LAMINATES

FOLLOWING our illustration and description in the October issue of a cutting tool for woven synthetic fabrics we now give the details of a Swiss cutting tool being marketed in this country by Trend Industrial Equipment, Ltd., 5 The Ridgeway, Stanmore, Middlesex, which has been used successfully for the cutting of glass/polyester laminates.

Powered by an electric motor, the saw blade has a reciprocating motion and is supported by a grooved roller containing minute pin bearings. The cutter can be fitted with slides or with a roller attachment for negotiating uneven surfaces. The cutting speed for ¼ in. glass/polyester laminates is 10 ft. per minute.

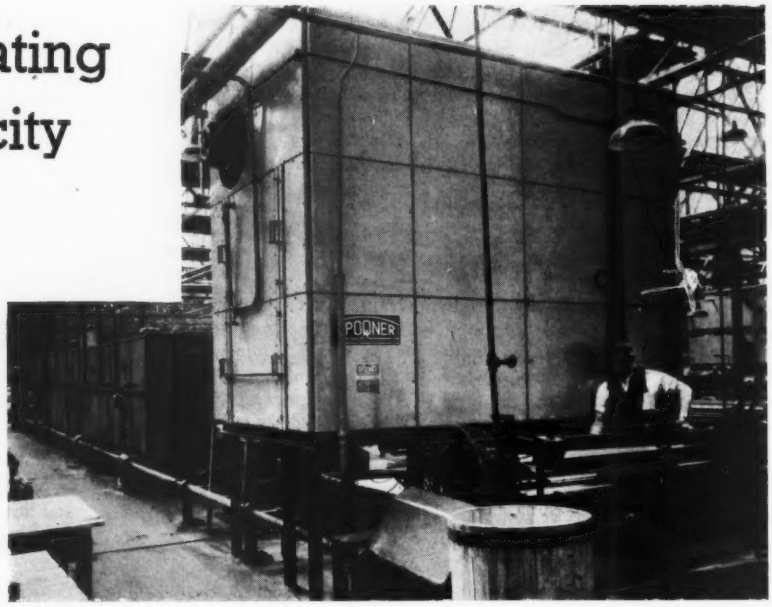
The fact that the cutter is portable makes it of considerable use in the trimming and cutting to size of large plastics fabrications. The saw blade is easily removed and can be replaced with other types making the machine suitable for the cutting of sheet metal and wood.

The electric motor can be supplied to suit voltages of 50, 110 and 200/250 volts according to requirements.

(Right) The electric saw used for the trimming of glass/polyester laminates.

Drying and Heating by High-velocity Air

By experiment and development of their own processes for the drying of textiles, The Spooner Dryer and Engineering Co., Ltd. have produced machinery which is now being used extensively for the fusing of p.v.c. and fabric. The process of using high-velocity heated air has enabled higher production rates and efficient heat transfer to be obtained with economy of running costs and space.



A tensionless vertical dryer used in tandem with a Stenter for shrinking and pre-drying fabric.

HEAT transfer, whether it be in the barrel of an extruder, the platen of a press, or for the many other applications in the forming of plastics materials, is one of the prime factors which have to be considered both in machinery design and fabricating techniques. Much work has been done to increase the efficiency of heat transfer in moulding machinery and extruders and other machinery, and it is therefore with considerable interest we were able to study the work which has been done in this field by The Spooner Dryer and Engineering Co., Ltd.

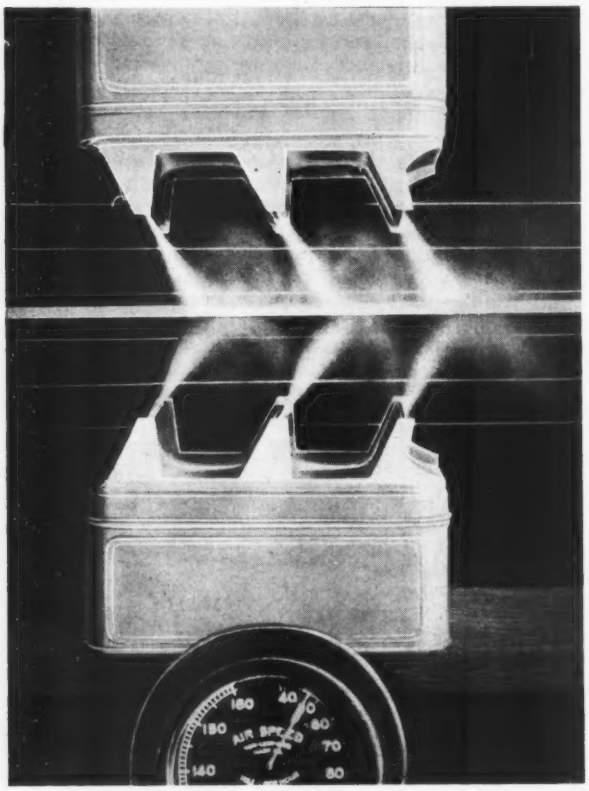


Fig. 1. The pattern of air as it strikes the moving belt.

Situated as they are at Ilkley in Yorkshire, their original interest was in the Textile and Paper Industry, but in recent years their machines have found increasing applications in the Plastics Industry. The company was formed in 1931 to build and market machinery employing, in those days, a revolutionary technique in drying textiles, based on the original research work carried out by Mr. Spooner.

Drying is basically the transfer of moisture from the article to the drying medium and its rate is controlled by four variables:—

1. Thermal conductivity of material.
2. Temperature difference between drying medium and material.
3. Velocity of drying medium over material.
4. Difference in vapour pressure of moisture in material and moisture in the drying medium.

The machines employed prior to the advent of the Spooner dryers were the well-known Stentering machines which dried by radiant heat or slowly moving hot air. These, although satisfactory in themselves, did not satisfy to the best advantage the requirements listed in the previous paragraph, and it was in an endeavour to fulfil these that the Spooner dryer was designed. Today, by a combination of the Spooner dryer for pre-drying and the Stenter for stretching and final drying, or the complete conversion of the Stenters to the Spooner technique, production times have been reduced considerably with an appreciable saving in space.

In the Spooner machines the drying medium is heated air containing a varying amount of superheated steam, depending on drying conditions and the material being dried. Convergent nozzles divide up this drying medium into thin streams. The static pressure in the pressure chambers is used to generate a velocity of approximately 70 ft. per second, at which speed the drying medium is projected on to the material. Rapid replacement of the heated air which has absorbed moisture is ensured. (Their original Patent No. 374,152 covering this principle was taken out in June, 1932.)

A special feature of this method is that there is a considerable temperature difference between the drying medium and the material until the majority of the moisture has been

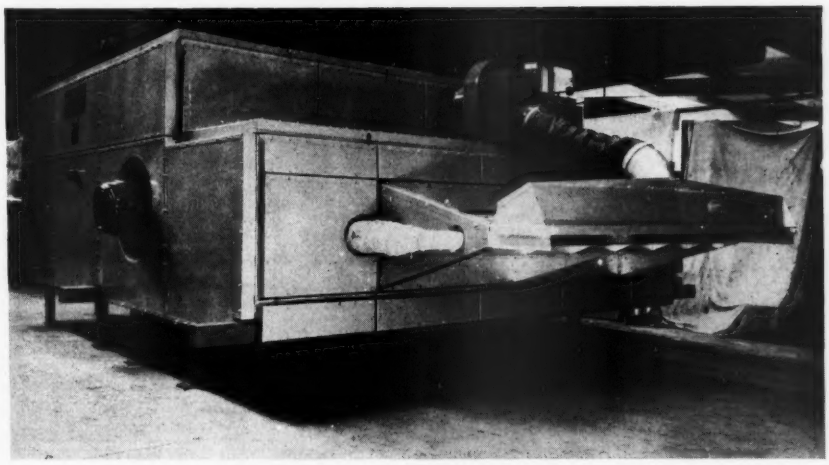


Fig. 2. The take-off end of the pre-heater used for heating the individual plys of p.v.c. belting.

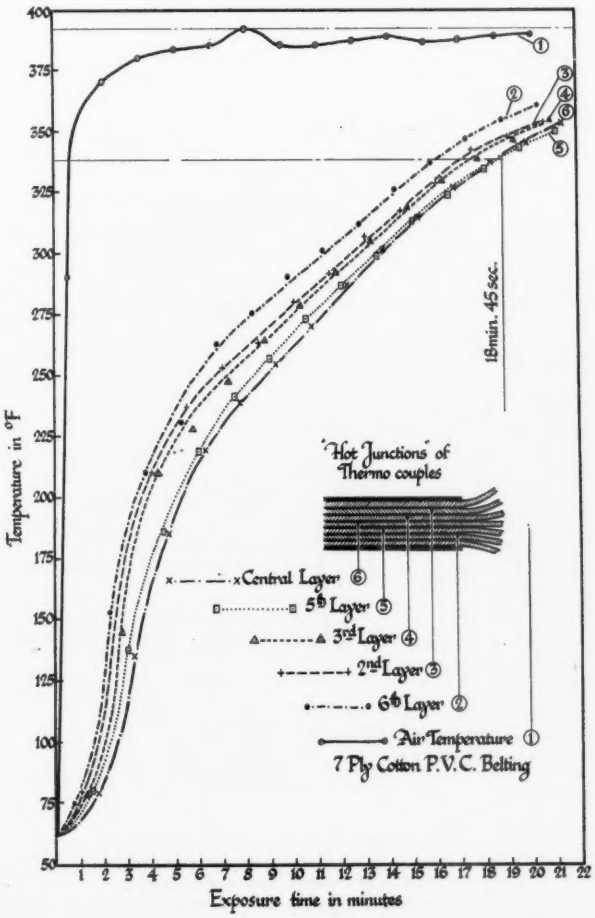
removed, after which the material temperature begins to rise rapidly. This principle is very important because the drying medium temperature can be raised to well above that which would normally damage the fibres of the material; it also dispels the theory long held in the Wool and Cotton Trades that temperatures in excess of 212° F. would spoil the fabric.

In Figure 1 the pattern of the air flow is illustrated. In the dryers the air is withdrawn from the oven and re-circulated after having fresh air added—this saves the wastage of heat which would occur if all the heated drying medium were expelled into the atmosphere. The actual heating of the drying medium can be by means of gas, electricity, oil or steam, according to the customer's requirements. A feature of this system is the accurate temperature control, which can be maintained to within plus or minus 2° F.

The advantages obtained by using this system can be summarized briefly as follows:—

1. Economy in running due to low heat loss afforded by re-circulating air.
2. Economy in space for a given output.
3. Accurate control of conditions giving a consistent product.
4. Better finish due to lower temperature of material when drying.
5. Given data on material to be treated, a guaranteed output and degree of evaporation can be maintained.

So far we have considered these machines in their original role as dryers, a role which is not unimportant to the Plastics Industry, especially to the manufacturers of laminates and of supported p.v.c. fabrics. With regard to the former, it should be mentioned that the plant has been used extensively for paper drying as well as fabric drying. There are, however, other applications where direct heat transfer is to be utilized. For example, part curing of laminating resins, fusing and bonding p.v.c. to fabrics, gelling and hardening of p.v.c. plastisols after moulding, and the drying of glue films, to name only a few. Perhaps the most important application of this type of machine at the present is in the production of p.v.c. conveyor belting for the coal mines. Machines have been designed and built for the fusing and bonding of the different plys, both as a whole and for pre-heating individual plys prior to their lamination. A machine of this latter type is shown in Figures 2 and 3. This machine will take widths up to 74 inches of 7-ply belting, heating them to between 330° F. and 340° F. at a rate of 4 ft. per minute,



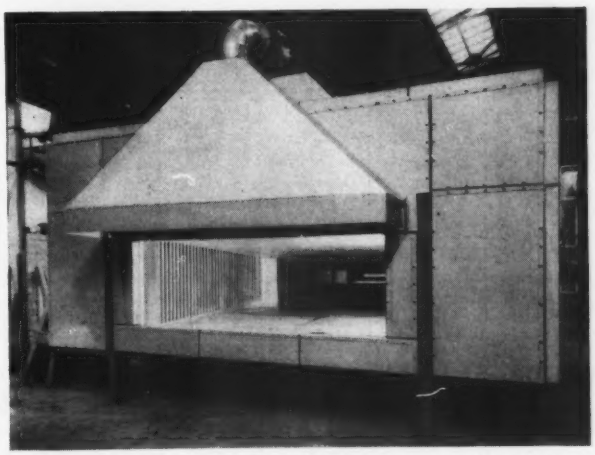


Fig. 3. (Above) Internal view of the pre-heater showing the air inlet and return nozzles. The guide rollers are not in position in this photograph.

Fig. 4. (Left) Graph showing heating cycle of 7-ply cotton p.v.c. belting.

within a space of 15 ft.! The nozzles are placed along the sides of the heating chambers and an air velocity of 20-25 ft. per second across the material is used.

Results of tests carried out on the other type of pre-heating machine—in which the plies are all placed together and heat is applied to the top and bottom covers—are plotted on the graph shown on page 419. The specification in this case requires a maximum air temperature of 392° F. and a minimum belt temperature of 338° F. with a maximum production rate. The machine was not to exceed 40 ft. in length. The results from the graph showed a heating time of 19 minutes, giving a speed of 2.1 ft. per minute—i.e., a production of 4.2 ft. per minute for two single-width belts passing through simultaneously.

This illustrates the approach of The Spooner Dryer and Engineering Co., Ltd., to inquiries, whether they be for pure drying or any heat-treatment problem. Each machine required is dealt with as an individual problem and a team of development and design engineers ensure that the problem is solved in the most economical and efficient manner. Although well-tried units may be used in its construction and even though similar machines for similar jobs are already being used elsewhere the original inquiry is still treated on its own merits.

An example of the research carried out on p.v.c. multi-ply belting is shown in the graph (Figure 4) which has been extracted from the Company's records. Even more explicit is the précis which we give of the development work which went into the production of machines for the fusing and bonding of extruded p.v.c. liners to fire hoses. The successful outcome of this venture is apparent by the number of companies now using these machines for this application.

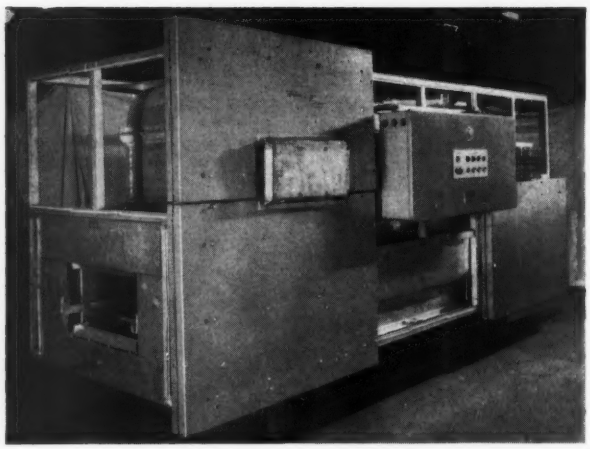


Fig. 5. The final design of the machine used for the fusing and bonding of p.v.c. hose liners.

The problems involved were many and varied, as can be seen.

Fusing of P.V.C. on Canvas Hose

A small sample of canvas hose was received from the customer on which was to be established (a) temperatures and times for fusing p.v.c.; (b) conditions under which p.v.c. bonds to canvas satisfactorily; (c) effect of high temperature on the canvas.

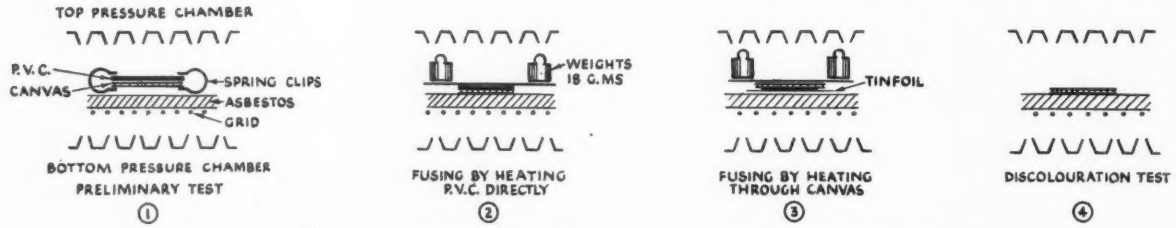


Fig. 6. Methods adopted (above) and results obtained (below) in the initial experiments on bonding p.v.c. to canvas.

Test and sample No.	Temperature	Exposure time	Method of fusing. Sketch No.	Results	Remarks
	°F.	min.			
1	400	1	–	—	P.v.c. displaced by air jets.
2	400	1	1	Not fused : not bonded	Exposure time insufficient.
3	400	3	1	Fused : not bonded	Will not bond without pressure.
4	400	1½	2	Partly fused : not bonded (3 p.s.i.)	Exposure time insufficient.
5	450	3	2	Fused : bonded (2½ p.s.i.)	Very poor surface; p.v.c. extruded out.
6	450	3	2	Fused : poor bonding (½ p.s.i.)	Better surface but pressure too low for bonding.
7	450	4	2	Fused : poor bonding (½ p.s.i.)	Increased exposure time not affecting bond.
8	450	3	2	Fused : bonded (3½ p.s.i.)	Bond not as good as 5?
9	500	4	3	Fused : bonded (¾ p.s.i)	P.v.c. bonded to asbestos also.
10	500	2	3	Fused : not bonded (1 p.s.i.)	Thick aluminium plate used between p.v.c. and asbestos.
11	500	2	3	Fused : bonded	Good results (thin aluminium sheet used).
12	500	1	3	Partly fused : not bonded	Not sufficient time allowed.
13	500	2	3	Fused : bonded	Good.
14	475	1¾	3	Fused : reasonable bonding	Good. Encouraging results.
15	475	2	3	Fused : good bonding	Good. Encouraging results.
16	475	1½	3	Fused : bonded	Good. Encouraging results.
17	475	2½	3	Fused : bonded	Good but possible discoloration of canvas.
18	475	2½	4	—	Definite yellowing of canvas.
19	420	1¾	3	Fused : not bonded	—
20	420	2½	3	Fused : not bonded	—
21	420	3	3	Fused : poor bonding	—
22	420	4	3	Fused : bonded	Good results.
23	420	4	4	—	Discoloration of canvas apparent.

Results from Tests Carried Out on Canvas Hose and P.V.C. Liner

Sample No.	Air temperature	Exposure time	Pressure p.s.i.	Fabric discoloration	P.v.c. fusion and finish	P.v.c. adhesion	Final result	Remarks
	°F.	min.						
1	400	10	10	Pronounced yellow/brown	Very high gloss. Perfect	Perfect ..	Poor	P.v.c. forced out through canvas.
2	400	4	7	Negligible ..	Very high gloss. Perfect	Perfect ..	Very good	—
3	400	3	10/5	Negligible ..	Very high gloss. Perfect	Poor ..	Not quite satisfactory	Time reduced too much for good adhesion.
4	400	3	15	Negligible ..	Dull shine. Poor ..	Poor ..	Not satisfactory ..	Pressure increase did not increase adhesion or diminish fusing.
5	400	4	10	Negligible ..	Very high gloss. Perfect	Perfect ..	Very good	Repeat Test 2 to check the best result.
6	350	6	10	None ..	Dull. Not fused.. ..	Very poor	Not satisfactory ..	Too low temperature.
7	360	10	10	Negligible ..	Dull shine. Not fused ..	Possible..	Not quite satisfactory	Still too low temperature.
8	375	7	10	Negligible ..	High gloss. Satisfactory	Good ..	Good	Good but long exposure time.
9	420	2½	10	Negligible ..	Very high gloss. Perfect	Good ..	Good	—
10	425	2¾	13	Negligible ..	Very high gloss. Perfect	Perfect ..	Good	Too high pressure used.

It was established that if a satisfactory bonding was to occur, pressure was necessary; this was applied by placing weights on a mild steel plate (18 g.) treated with silicone grease (method 2) the steel allowing a good transfer of heat to the p.v.c. Further tests were carried out on transferring the heat through the canvas to the p.v.c. but bonding occurred between the p.v.c. and the asbestos sheet. Method 3 was then adopted and encouraging results were obtained, although canvas discoloration proved a limiting factor. It should also be noted that there must be in these experiments a certain amount of heat transfer between the asbestos sheet which should be taken into account.

Following this initial work, experiments were carried out on actual hose into which the extruded liner had been placed. It was decided from the previous experiments that if a pressure of 6 p.s.i. or over could be maintained inside the hose and heat applied externally, fusion and bonding should take place. It was then necessary to find the correct temperature, exposure time and pressure.

From the above results 400° F./4 min./10 p.s.i. appeared to give the best results without imposing too rigid a control on the variables. Further tests were carried out, at reduced internal pressure. This was necessary as hydraulic tests on the lined hose had not been wholly satisfactory due to the migration of the p.v.c. through the fabric with consequent leakage. The migration of the p.v.c. was particularly apparent at the fold in the hose where the weave of the fabric had been stressed. For this reason it was deemed advisable to make several tests on different fabrics and to report on them accordingly. This was done and the results of these tests are given in the table below. It should be noted that the adhesion tests were carried out to British Standards Specification 924 : 1943 Appendix B.

Final results proved entirely satisfactory and the report ends modestly: "Best results have been obtained at 380° F./6 min. and 400° F./4 min. Complete fusing and bonding can be obtained by this method."

The machine in its final form is shown in Figure 5. As can be seen, it is mounted on rails and is moved down the length of hose at a pre-determined speed. This movement of the machine is necessary for two reasons. The first is a matter of the space which would be required if the length of hose were to be passed through the machine. The second is the fact that an air pressure has to be maintained inside the hose, and the movement of the hose couplings and the attached compressed air lines would result in a complicated and unwieldy arrangement.

Further developments in design with a view to increasing the efficiency of the Spooner machines are being tried out, and introduction of high-speed axial-flow fans, of greater aerodynamic efficiency, will increase the velocity of the heated air up to 125 ft. per second with a corresponding shortening of the processing time and increase in the efficiency of the machine.

Finally we should like to record our thanks and appreciation to the Spooner Dryer and Engineering Co., Ltd., for the facilities which they made available to us in the compiling of this article. Also to thank their staff and technicians for the co-operation received from them.

Bonding P.V.C. to Different Types Weave

Sample No.	Air temperature	Exposure time	Hose air pressure, p.s.i.	Remarks
	°F.	m. sec.		
20	400	3 50	4	Perfect fusion and adhesion; rough-weave fabric; several small holes developed on old folds of canvas.
21	395	3 30	3	Perfect fusion; adhesion approximately 5 lb. (just satisfactory); appearance good.
22	395	3 30	2	Perfect fusion; adhesion satisfactory; appears good.
23	395	3 30	1½ m. 5 2 m. 2	Perfect fusion; adhesion satisfactory; appears good. Weave seems finer and closer, but several faults in weave cause projections and unevenness of p.v.c. lining.
24	392	3 30	2 m. 4 1½ m. 2	Perfect fusion; adhesion perfect on the "in" end but weak on "outer" end; no holes, but not quite satisfactory.
25	390	3 30	4	Fused well; weak adhesion otherwise good. Unsatisfactory.
26	398	3 45	5	Fused well; adhesion very good. Closer weave gives smooth lining which appears very good.
27	398	3 30	3	Fused well; adhesion satisfactory; appears good.

Conclusions.—From this last series of tests it appears that to achieve a satisfactory adhesion the p.v.c. has to be liquefied, and then it depends entirely on the type of weave whether the sample remains waterproof or not. It appears that pressure applied inside the hose has very little influence on plastic being forced through. It is, however, very difficult to use pressure below 3 p.s.i., as the hose is not inflated enough. "Good pressures" from handling point of view are not less than 5 p.s.i. It is our belief that all reasonably close-woven hoses can be easily and correctly fused by this method.

Plastics in High-speed Aircraft

Brief extracts from a paper entitled "Some Problems Affecting the Use of Plastics in High-speed Aircraft," by Dr. M. G. Church, of the Ministry of Supply, read before the Plastics Institute (London Section) on November 17.

IN introducing his paper, Dr. Church referred to a previous meeting of the Plastics Institute (London Section) which had, as the subject for its discussion "Is the Plastics Industry Satisfying the Needs of Its Customers?" He recalled that on that occasion he was asked to speak as a member of a Government department, which was, and is, quite a large customer of the plastics industry. During his latest talk on November 17 this year, he enlarged on some of the points he had made previously. Stressing that what he had to say was in no sense a criticism of the industry, but rather a plain statement of facts to indicate the problems the aircraft industry is up against, he proceeded to deal with several important applications of plastics, where the problems are such that the only solution appears to be in the improvement of the materials themselves.

"One such application is the manufacture of housings for radar scanners and other aerials.

"The other application that I want to deal with this evening is the use of plastics in the transparent enclosures of aircraft cockpits.

"In practically all the materials used in aircraft transparencies, plastics play a critical part. This is of course immediately obvious in the acrylic canopies of fighter aircraft but some may not be aware that most of the glass used in aircraft cockpit enclosures is laminated with a plastic interlayer, viz., plasticized polyvinyl butyral.

"The two applications which I intend to discuss have much in common. Both are transparencies, one for radar and radio and the other for optical observations. Both are completely exposed, usually in forward looking positions, where they are subjected to air loads during flight as well as anything that the atmosphere has to offer in the form of rain, hail, grit, etc. For each there are closely defined requirements covering transparency and strength.

"There the similarity largely ends at least as far as current usage is concerned since the materials used for these applications are today very different in type. The radomes use glass-reinforced polyesters which are cross-linked while the fighter canopies use straight chain acrylic ester polymers."

Dr. Church regarded them as critical applications in which the use of plastics was likely to continue. He then went on to discuss the problems that arise when these applications are considered in relation to the high-speed aircraft.

"The first problem I wish to discuss is that of erosion by rain. When an aircraft flies through rain all the leading surfaces are bombarded by the raindrops and erosion of these surfaces can occur. All known materials used in aircraft construction erode to different degrees when subjected to high-speed rain. Plastics generally speaking are rapidly and badly eroded but even metals such as the light alloys and glass will suffer erosion at surprising low speeds.

"I have mentioned already that the materials used for these radar housings are reinforced plastics of the low-pressure type, mainly glass-reinforced polyesters. Erosion of these materials occurs at a surprisingly low speed. At 500 m.p.h. the erosion in rain is so rapid that in a matter of minutes a conventional glass-reinforced polyester laminate is eroded to a state in which it is useless and may begin to disintegrate.

"This erosion occurs at 500 m.p.h. in typical rain conditions. At higher speeds the erosion is much more rapid. There is evidence to show that the rate of erosion is proportional to the 7th or 8th power of the speed.

"You will see from what I have said that even at the speeds of currently produced aircraft we have here a very serious problem. The problem is rapidly becoming more acute as speeds increase. Calculations made in America suggest that the rate of erosion increases by a factor of 10, 7 or 8 with increasing speed. At $M=2$ the energy in a raindrop of size 1.9 mm. diameter is about 20 ft.-lb."

Aerodynamic heating was then discussed in relation to the materials currently used in the applications discussed. It is caused by air being compressed by an aircraft at speed, changing the air's velocity, and then generating heat. In addition, under conditions of ordinary flight there is a velocity gradient in the air immediately adjacent to the aircraft skin. The air in contact with the skin is at zero velocity with respect to the aircraft. At a short distance from the aircraft surface the air is at the full velocity of the airstream. This layer of steep velocity gradient is called the "boundary layer." It will be appreciated from this that the viscosity of the air is of importance since work will have to be done in sliding one layer of air over another and this tends to increase the temperature of the air in this boundary layer.

"In calculating the actual skin temperature of the aircraft you will readily appreciate that various other factors will come in which will be peculiar to the actual case. Thus the rate of heat flow into the surface which depends on velocity and altitude, i.e., on the mass of air flowing in unit time over the surface and also on the specific heat, thermal conductivity and emissivity of the surface. Also the thickness of the surface skin and any artificial cooling of the inside surface will have an effect.

"It is thus difficult to generalize more than to say that the rate of heat flow favours high-altitude flight and that these various factors all tend to reduce the temperature of the aircraft skin below the temperatures derived from this formula.

"If we consider flight above 36,000 feet where the atmospheric temperature is about $-56.5°$ C. we can calculate the following boundary-layer temperatures:—

Mach No.	1	2	2.5	3	3.5	4
T (laminar) ..	−20	90	170	268	378	504° C.
T (turbulent) ..	−18	99	184	287	404	530° C.

These calculations take into account variations in specific heat of air with temperature.

"These figures are for high-altitude flight under the most favourable conditions, i.e., the lowest ambient temperature. The temperature of the air at these altitudes varies from region to region being warmer over the Arctic areas and colder over the Tropical zones. Thus over the Arctic the average stratospheric temperature is $-40°$ C., which means that for a similar flight case over the Arctic the boundary-layer temperatures I have given should be increased by approximately 15° C.

"From this it will be appreciated that the case of flight at lower altitudes is even more severe, the boundary-layer temperatures given increasing by the difference between the ambient temperature and $-56.5°$ C.

"The average sea-level ambient may be taken as 15° C., and in this case the corresponding temperatures in the table are:—

Mach No.	1	2	2.5	3	3.5	4
T° C. (laminar) ..	64	207	322	462	612	797
(turbulent) ..	67	219	337	482	647	847

"This then is our problem. We are now in the fringe of air speeds in which the aerodynamic heating effect is beginning to aggravate the material supplier. Aircraft and aircraft engine design is advancing at such a rate that soon we shall be faced with a situation where the advance is being held back because the materials required are not available."

New Productions

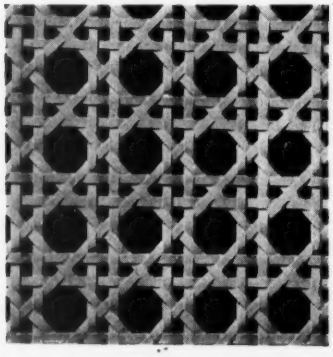
Sidecar Windows

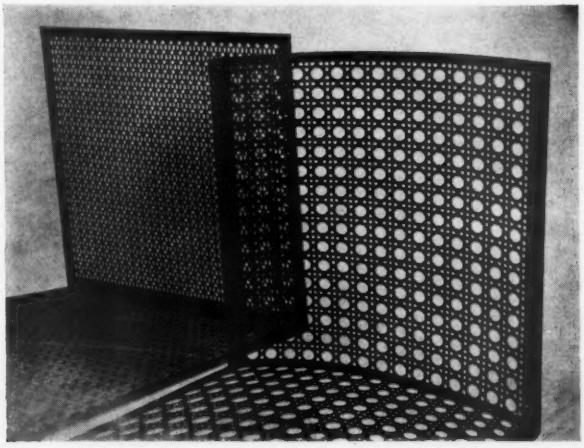
Shown for the first time by Canterbury Sidecars, Ltd., at the recent Motorcycle Show was their Carmobile combination which has been designed to carry three people as well as the driver and the pillion passenger. Although the sidecar itself is not constructed of plastics materials the side windows and the curved light immediately above the windscreen are made from Cobex rigid vinyl sheet. The use of this material in such an application is indicated by the requirements of optical clarity and its non-splintering characteristics. Cobex sheet is supplied by B.X. Plastics, Ltd., Higham Station Avenue, London, E.4.

The Canterbury sidecar with Cobex vinyl sheet windows.

Perforated P.V.C.

Successful trials have been concluded on the perforation and embossing of rigid p.v.c. sheet. G. A. Harvey and Co., Ltd., have proved that almost any type of design can be reproduced. The photographs illustrate the finished sheet and a close-up of the perforations and embossing. It will be seen that a very realistic pattern can be reproduced and this technique should open up many new fields of application for Cobex rigid Geon p.v.c., on which it is being applied, both in interior decorating and other industrial uses where decorative grilles are generally used. One of the advantages of this sheet over metal is the saving in weight, it being approximately 1/5th the weight of mild steel. Also it will be available in an unlimited range of colours with a high surface finish which will remain for an indefinite period without any marked depreciation.





(Left) Perforated and embossed p.v.c. grilles shown by G. A. Harvey and Co. Ltd. at the Building Exhibition.

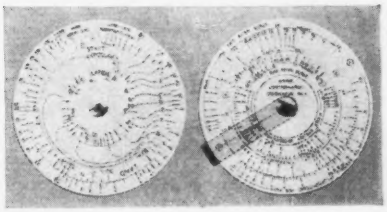
Polythene Jerricans

Bearing a marked resemblance in design to the original metal jerricans introduced by the Americans, the new polythene ones illustrated are being marketed by Rediweld, Ltd., 15-17 Crompton Way, Crawley, Sussex. Two stock sizes are available, the half gallon and the gallon and a quarter size, the former weighing 13 oz., the latter 35 oz. Besides their normal application for the transporting of petroleum spirits, their use has now been extended into the corrosive chemical field by the use of polythene. The dimensions of the cans are 8 in. by 6 in. by 3 in. for the half gallon size and 11 in. by 8 in. by 4in. for the larger size.

Polythene Jerricans.

Radio Activity Calculators

Rigid vinyl sheet has been used for the construction of the two radio activity calculators illustrated because of its dimensional stability. The Radiac Calculator No. 1 is used to determine the dose-rate at a given time, the initial dosage and time being known. The second calculator is used to determine the degree of water contamination after the explosion of an atomic weapon. The calculators are produced by Blundell Rules, Ltd., Chaul End Lane, Luton.



(Right) Radio activity calculators now being produced on Cobex vinyl sheet by Blundell Rules Ltd.

Plastics NEWS

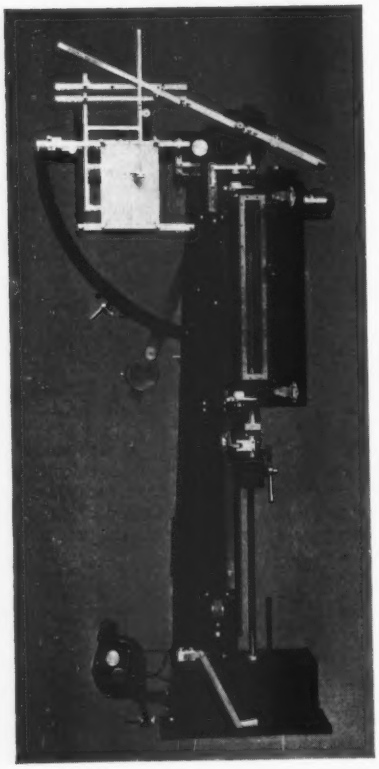
Raw Materials, New Plant, Works Organization, Control Apparatus, Research, Personal and Trade Notes

TENSION TESTER.—Manufactured by Appareils Lhomme and Argy and solely distributed in this country by Binney and Smith and Ashby, Ltd., 116 Cannon Street, London, E.C.4, the tension tester illustrated has been designed to perform a number of different tests under a variety of conditions. In addition to the measurement of elongation (up to 1500%) it is also possible to determine the following:—

Hystersis, compression, adhesive strength, resistance to shear, resistance to tear, resistance to perforation, bond strength, etc.

Various models are available with breaking loads from 100 kilos to 1,000 kilos or the equivalent in British units. They are produced as either horizontal or vertical machines with dial or quadrant load scales, the speed of separation of the grips varying from 0.01 in. per minute to 20 in. per minute in accordance with the requirements.

The model shown in the illustration is fitted with an insulated interior illuminated chamber for testing at temperatures up to 150° C. and is specially equipped to permit rapid change of test specimens with minimum loss of oven temperature during this operation.



The tension tester distributed by Binney and Smith and Ashby, Ltd.

NEW FINNED TUBE HEATER.—The General Electric Co., Ltd., has developed a finned tube heater which combines a high rating with a large surface area. It is particularly suitable for industrial ovens and drying rooms where temperatures of 200° F. to 350° F. are required. In natural convection ovens working between such temperatures the heater has an operating surface temperature of about 500° F.

The heater comprises a mild steel tube with a crimped gill, of 4 in. outside diameter. This tube houses a withdrawable element consisting of a spiral, operating at low temperature, carried on insulators which are assembled on a metal runner. The tube is supported by brackets and weighs about 7 lb. per foot run. A mild steel connecting box is provided at one end of the heater with a bracket for conduit entry at the base. Automatic temperature controls for controlling room or oven temperature can be supplied as required.

ORGANO TIN COMPOUNDS.—Albright and Wilson, Ltd., have concluded an agreement whereby they have the rights to make and sell the range of organo tin compounds made by the Metal and Thermit Corporation in the United States of America.

These compounds confer outstanding heat stability on p.v.c., making it possible to produce unplasticized compositions in the form of sheet and unmoulded sections. Such products are rapidly becoming of importance in industry as light structural materials, the high chemical resistance of which makes them particularly suitable for the manufacture of pipes and ducting.

The organo tin compounds are also used in plasticized formulations in the production of water-white transparent sheet and tubing.

The organo tin compounds manufactured under this agreement, together with metallic soaps, epoxide resins, and organic phosphites, comprise the Mellite range of stabilizers marketed by the Organic Chemicals Division of Albright and Wilson.

NEW ELECTRIC HOISTS FOR BRITISH INDUSTRY.—Now available on the British market, is a new range of electric hoists, supplied by Taylor Stoker Co., Ltd.

Christmas Greetings

The Editor and Staff of *Plastics* extend Christmas Greetings and Good Wishes for the New Year, to their readers at home and abroad.

The Munck hoist as supplied by Taylor Stoker Co., Ltd.

The Munck hoist is of all-steel construction, enclosed in a steel housing, with the motor automatically engaging or releasing the brake. The gearbox, brake and electrical contacts are all enclosed in the housing. A rope guide ensures the rope winding correctly on the drum in spite of any carelessness on the part of the operator. The rope guide also actuates, automatically, a limit switch to prevent overwinding and overlowering.

A variety of lift heights and speeds is available to cater for the needs of practically every type of installation from a small workshop to a vast factory or warehouse.

Further particulars may be obtained from Taylor Stoker Co., Ltd., 189-191 Drummond Street, London, N.W.1.

ISOMERS OF SEBACIC ACID.—The first commercial plant in the world for the production of isomers of sebacic acid, known as "U.S.I. Isosebacic" acid, will be built at Tuscola, Illinois, it was announced by Dr. Robert E. Hulse, vice-president and general manager of the U.S. Industrial Chemicals Co., Division of National Distillers Products Corporation, 99 Park Avenue, New York 16, N.Y. Initial production capacity of the plant will be 10 million pounds per year and completion of the plant is scheduled for early in 1957.

"U.S.I. Isosebacic" acid is a mixture of isomers of sebacic acid in approximately the following proportions:—

2-ethyl suberic acid ...	... 72-80%
2,4-diethyl adipic acid	... 12-18%
Sebacic acid	... 6-10%

The product shows considerable promise as a raw material for vinyl resin plasticizers with excellent low-volatility, non-migration, and low-temperature characteristics.

Other promising applications include: the production of polyamide (nylon type) moulding and extrusion plastics and adhesives; alkyd resin manufacture, to impart flexibility and water resistance to the surface coating film; the synthesis of ester lubricants of the type used in jet-propelled

aircraft; the production of polyester resins; the synthesis of polyurethane resins; synthetic rubber and protective coatings.

This new chemical is produced by a process for which the principal raw materials are butadiene, and sodium.

SOLVENT RECOVERY.—A new 36-page booklet on the Columbia activated-carbon system of solvent recovery has been issued by Carbide and Carbon Chemicals Co., a division of Union Carbide and Carbon Corporation. The booklet gives technical data on activated carbon and describes the efficiency and economy of recovering solvent vapours in a variety of industries.

COLOUR RANGE.—Messrs. Holzverzuckerungs, A.G., of Zurich, manufacturers of Grilon (nylon 6), announce a new range of 23 colours of Grilon for injection moulding. Colour swatches, prices and technical information can be obtained from their exclusive representatives in the U.K., Lawfer and Co., Ltd., 27 Regent Street, London, S.W.1, telephone number Regent 1584.

COPY-MILLING MACHINE.—The new copy-milling machine being distributed by Mortimer Engineering Co., 210 Acton Lane, Harlesden, London, N.W.10, has several novel features including hydraulic vertical lift, with which it is possible to work to angles of 90° when moving upwards or downwards. The B.P. 5 machine has been designed to copy-mill in the ratio 1 : 1 three-dimensional moulds and in addition a pantograph arm which will produce two-dimensional work in variable ratios between 1:3 and 1:100. The spindle speeds are infinitely variable from 165 to 6,560 r.p.m. The work table, size 40 in. x 9 in., has a vertical movement of 13½ in., and longitudinal and cross movements of 14 in. and 8 in. respectively. The centre distance between the cutter and the tracer is 10 in. to 20 in. The machine can, in addition to copy-milling, be used as an orthodox vertical milling machine.

The new office block of E. Elliott Ltd., at Summer Lane, Birmingham, 19.

LABORATORY EQUIPMENT.—The latest Baird and Tatlock bulletin gives details of new laboratory equipment, including water baths, embedding bath and ovens, and Butchart balance.

POLYSTYRENE. — High-impact polystyrene, Grade CP.20, marketed by Erinoid, Ltd., has now been specifically approved by the Ministry of Supply for the production of secondary battery boxes for aircraft.

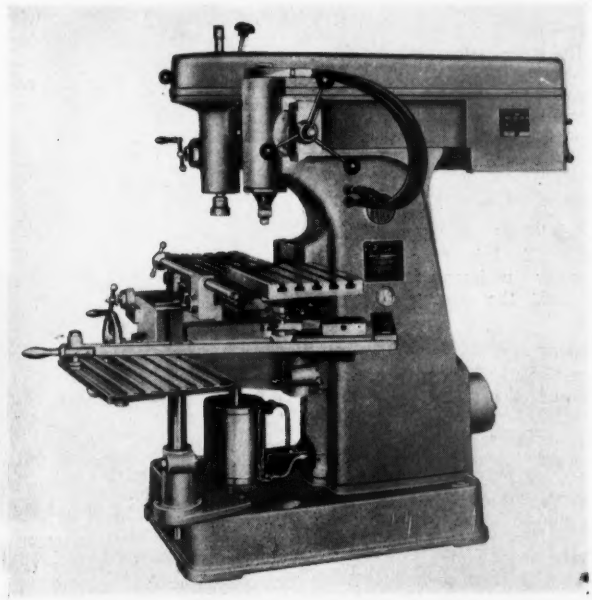
FOAMING AGENT.—Glyco Products Co. Inc., Empire State Building, New York 1, N.Y., announce the production of polyethylene glycol 600 mono oleate as a foaming agent. As a non-ionic surface-active agent, it has been found particularly efficient in dispersing water completely so that a uniform reaction takes place. The concentration used is about 0.5%.

CHANGE OF ADDRESS.—Griffin and George, Ltd., have closed down their premises at Kemble Street, Kingsway, London, and all London and Southern Counties orders and correspondence should now be addressed to Ealing Road, Alperton, Wembley, Middlesex.

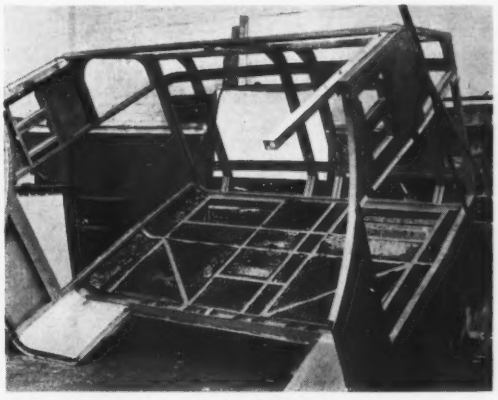
NEW OFFICES.—Arising from the merger of Hordern-Richmond, Ltd., with Permali, Ltd., last year, new Manchester premises for both companies have now been opened at 3rd Floor, B Block, 89 Oxford Street, Manchester, 1. All inquiries in the northern area for electrical, mechanical, chemical and textile components and materials should be referred to the new address. In addition, the same address is also the northern office of the newly formed company Hydulignum-Jaoroc (Tools), Ltd., manufacturers of densified wood tools, metal tools and those which are a combination of various metals.

JOHN GOSHERON AND CO., LTD., will be moving shortly to new premises to be known as The Packaging Tape Centre, Vauxhall Bridge, London, S.E.11.

AMERICAN AGENCY.—The Merchandizing Division of The Solartron Electronic Group, Ltd., Thames Ditton, Surrey, is now the appointed agent for The Consolidated Engineering Corporation, Pasadena, California, U.S.A., and associated companies, for the United Kingdom, Eire and certain parts of the British Commonwealth.



(Left) The copy-milling machine being distributed by Mortimer Engineering Co.



(Above) Fitting Isoflex cellulose acetate thermal insulation to the cab of the "Mighty Antar" tractor, produced by Transport Equipment (Thornycroft) Ltd.

NEW OFFICES.—The Sheffield office of Honeywell-Brown, Ltd., the industrial instrument manufacturers, has been transferred to larger premises at 119 Petre Street, Sheffield, 4.

Mr. E. B. Foskett has been appointed manager of their Glasgow office.

AREA OFFICE.—Wickman, Ltd., have opened a new area office at 36 Market Street, Nottingham. The office will be under the control of Mr. E. J. Swinn. Mr. G. Archibald has been appointed acting area manager in succession to Mr. J. Macgregor.

NEW BRITISH INSTRUMENT COMPANY.—West Instrument Corporation of Chicago have formed a subsidiary in the United Kingdom to manufacture a full range of precision industrial temperature-control equipment. The subsidiary, known as West Instrument, Ltd., have opened offices at 1 Newman Street, London, W.1, whilst their new factory at Hersham, Surrey, is being completed. Mr. James A. Hartnett has been appointed managing director.

MR. A. E. LEVER, A.I.R.I., has now moved to a new laboratory and correspondence should be addressed to Cherry Cottage, Felcourt Road, Lingfield, Surrey.

D. B. BENEDICT.—The appointment of D. B. Benedict as a vice-president of Carbide and Carbon Chemicals Co., a division of Union Carbide and Carbon Corporation, has been announced by H. B. McClure, president of Carbide and Carbon Chemicals Co. Mr. Benedict will be responsible for the company's long-range planning in certain research and development activities, as well as all programmes on synthetic fibres.

SIR BERNARD KEEN, D.Sc., has been appointed scientific adviser to Baird and Tatlock (London), Ltd. Until recently he was director of the East African Agriculture and Forestry Research Organization.

DR. E. M. HUNT has been appointed general manager of Styrene Products, Ltd. He was formerly personal assistant to Mr. P. C. Chaumeton, technical director of Erinoid and managing director of Styrene Products.

Dr. E. M. Hunt, recently appointed general manager of Styrene Products, Ltd.

Mr. H. V. Potter being presented with an album of employees' signatures on his retirement as managing director of Bakelite, Ltd. Mr. C. C. Last is making the presentation.

MONSANTO CHEMICALS, LTD.—At a meeting of the board of directors of Monsanto Chemical, Ltd., held on November 1, it was announced that Mr. Philip A. Singleton has resigned from the board in order to take up a new appointment with Monsanto Chemical Co., St. Louis, U.S.A. At the same meeting, Mr. D. R. Mackie, commercial director, was appointed acting managing director of Monsanto Chemicals, Ltd.

NEW APPOINTMENTS.—Mr. A. Lawrence and Mr. J. H. Ward have been appointed sales director and works director respectively of Lacrinoid Products, Ltd.

MR. N. A. CUTLER, chief chemist of Hornflowa, Ltd., has been awarded the degree of Doctor of Philosophy at Leeds University.

THE GEIGY CO., LTD., APPOINTMENTS.—Mr. L. R. Dowsett has been appointed sales manager of the Plastics Chemical Division. Mr. G. H. Mann has been appointed London sales manager of the same division.

CHEMICAL CLUB.—At the annual general meeting of the Chemical Club, held at 2 Whitehall Court, London, S.W.1, on October 31, Dr. E. H. T. Hoblyn was elected president in succession to Mr. F. E. Warner. Dr. S. H. Bell was elected chairman of the executive committee, succeeding Dr. Hoblyn, and Messrs. C. Frenkel and F. E. Warner were elected to the committee. Dr. J. Hoy Robertson, hon. secretary, and Dr. Trevor A. Smith, hon. treasurer, were re-elected.

MR. C. M. TUNLEY has joined the staff of Expandite (S.A.) (Pty.), Ltd., Johannesburg, South Africa, after undergoing training at Expandite, Ltd., the parent company in London.

NEW B.S.I. APPOINTMENTS.—Sir Herbert Manzoni has been elected chairman of the general council of the British Standards Institution.

Sir Roger Duncalfe was re-elected president and Mr. John Ryan elected vice-president.

Sir Stanley Rawson was elected chairman of the B.S.I. engineering divisional council.

MR. H. V. POTTER, who announced his retirement from the position of managing director of Bakelite, Ltd., was presented with a silver salver by the employees at a luncheon held in Grosvenor House, London. A few days previously Mr. Potter had been presented with a television set by Mr. P. Huffman, vice-chairman, on behalf of the board. Mr. Potter is continuing as chairman of the company.

EXECUTIVE DIRECTORS.—Mr. C. E. Cleeve on presenting the accounts of Erinoid, Ltd., on December 8 announced the appointment of Mr. A. M. Bremner, Mr. L. Davis and Mr. J. N. Smith as executive directors.

MR. JOHN SHIRREFF has been appointed vice-president of Johnson, Matthey and Mallory, Ltd., the Canadian associate of Johnson, Matthey and Co., Ltd.

MR. CECIL TURNBULL.—It is with regret that we announce the death of Mr. Cecil Turnbull, a director of Hercules Powder Co., Ltd. In recent years Mr. Turnbull had been principally responsible for the company's interest in cellulose products and was closely associated with the establishment of British manufacturing facilities for cellulose acetate at Lancaster. He was 53.

MR. SEYMOUR BOOTH.—It is with regret we announce the death of Mr. Seymour Booth, for many years a director of The British Vacuum Cleaner and Engineering Co., Ltd.

Dr. H. I. Bull, the general works manager of the I.C.I. Plastics Division at Welwyn Garden City.

RADIO SHOWS.—The Radio Industry Council announces that the 23rd annual National Radio and Television Exhibition will be held at Earls Court, London, from August 22 to September 1, 1956, with a pre-view for overseas and other special guests on August 21.

The Radio and Electronic Component Manufacturers' Federation announces that its annual private exhibition will be at Grosvenor House, London, W.1, from April 10 to 12, with a pre-view for overseas and other specially invited guests on the afternoon of April 9. Application for admission has to be made in advance to the Radio and Electronic Component Manufacturers' Federation, 21 Tothill Street, London, S.W.1.

NATIONAL PLASTICS EXPOSITION.—The Seventh National Plastics Exposition will be held from June 11 to June 15, 1956, at the new Coliseum in New York City. The National Plastics Exposition is a trade show representing all branches of the one and a half billion dollar plastics industry, and companies interested in the plastics industry from all over the United States will display the latest plastics end-products and the newest raw materials. They will also demonstrate the newest developments in machinery, equipment, tools, dies, moulds and plastics manufacturing processes.

FURNITURE EXHIBITION.—The Exhibition, sponsored by the British Furniture Manufacturers' Federated Associations, is to be held at Earls Court, London, from January 23 to February 2, 1956.

EXHIBITION.—Greenwich Plastics, Ltd., held an exhibition at Manchester, London and Dublin of their latest printed and textured effects of p.v.c. and p.v.c.-coated fabrics. On show for the first time was the new p.v.c. film, .002 in. thick, which, it is expected, will find many applications in the packaging field.

ANNUAL GENERAL MEETING AND LUNCHEON.—The 13th annual general meeting of the Gauge and Tool Makers' Association was held at the Savoy Hotel, London, in the afternoon of Wednesday, November 16, 1955. It was preceded by an informal luncheon at 12.30 for 1 p.m. on the same day for members of the Association only.

During the luncheon, the Certificates of Craftsmanship and Certificates of Gauge and Tool Design granted during the past 12 months were presented to the successful applicants by the President and Chairman of the Association. The President and Chairman also presented the prizes for the winning entries in this year's Competition in Craftsmanship and Draughtsmanship, which is the fifth in the series of such competitions held by the Association.

ANNUAL GENERAL MEETING.—The Society of Chemical Industry has announced that its 75th annual general meeting will be held in London next year, probably in the second week of July. Further details will be published in due course.

IMPORT LICENSING REGULATIONS.—Notice to Importers No. 740 which supersedes No. 635, summarizes the various import licensing regulations which are of general application, and explains the effect of the new Open General Licence. The notice has been issued by the Board of Trade. Import Licensing Branch, 43 Marsham Street, London, S.W.1.

NEW PUBLICATIONS.—I.C.I. have produced two new publications, the first "The Principles of Injection Moulding," as its name implies, gives a lucid description of the many facets of the injection-moulding technique. The second, "Nylon," is devoted to the properties of the I.C.I. range of nylon, with examples of its use.

IMPORT QUOTAS.—Licensing arrangements for the global import quotas for the first half of 1956 for goods (other than paper, board and paper-making materials) still subject to the import restrictions imposed in November, 1951, and March, 1952, are announced by the Board of Trade in Notice to Importers No. 761 (issued by the Import Licensing Branch, dated November 10).

As in previous periods, the quotas will be allocated on the basis of trade in a past period and, in general, the licensing arrangements, the principal countries concerned and method of applying for licences will remain unchanged.

REVISED BRITISH STANDARD.—This revision of British Standard 1733 recognizes the demand for a wider range of orifice sizes for flow cups, and six sizes of Type A, corresponding to the A.S.T.M. cup, are now included. Further, the number of sizes based on the Ford "cup viscometer" (Type B) has been increased to four.

The tolerance of ± 0.0001 in. on the orifice diameter of Type A cups has been relaxed to ± 0.0005 in., the same as for Type B cups.

The revision specifies material, dimensions for the cups and their methods of use. Recommendations for the care of the cup, including periodical checking for wear and possible damage, are given. Average flow times of selected mineral oils and instances of the variation of flow times with ambient temperature are also included for guidance.

Copies of this standard B.S. 1733 : 1955 may be obtained from the British Standards Institution, Sales Branch, 2 Park Street, London, W.1, price 3s. each.

NEW POLYTHENE EXTRUSIONS.—Anchor Plastics Company, Inc., 36-36 36th Street, Long Island City 6, New York, announce that they have available preliminary extruded samples of Super Aeroflex polythene.

(Above) A photograph showing the use of Velbex p.v.c. used for the translucent walls of the Workers' Canteen on the set of the Associated British-Holiday Films Production "1984."

(Left) The exhibition of p.v.c. fabrics at Manchester staged by Greenwich Plastics, Ltd.

SWEDISH PLASTICS CONFERENCE.—We have received the following information from Mr. N. B. Punfield, of Punfield and Barstow (Mouldings), Ltd., as an appreciation of the welcome the British party received on their visit to Sweden.

Representatives from 12 countries attended the recent conference held in Stockholm. Besides the high standard of technical papers which were read, an impressive feature for the British party was the cordial welcome which was extended to them. On arrival, each received a welcoming letter from Mr. Jan-Erik Janson, the managing secretary, together with a complete list of lectures and a book in English, "How to Feel at Home in Sweden."

At the annual dinner, Mr. W. C. Waghorne, president of the British Plastics Federation, was accorded the place of honour next to Mr. H. Nystrom, chairman of the Swedish Plastics Federation. Mr. Waghorne replied to the welcome address given by Mr. Nystrom.

PLASTICS INSTITUTE VISIT TO DUSSELDORF.—Mr. John Prior, chairman of John Prior Engineering, Ltd., has written to us to record publicly his appreciation of the arrangements made by the Institute for the members who visited the Düsseldorf Exhibition. He wished especially to thank Mr. Harold Lusty for his good efforts.

BUILDING EXHIBITION.—Introduced for the first time at the Building Exhibition by The Yorkshire Copper Works, Ltd., were a range of Plastronga pipe fittings injection moulded in the high-molecular weight polythene. The new material gives a melting point of 128°-135° C. and an increased tensile strength (between 2,700 and 3,000 p.s.i.).

Also new, was an original application for injection-moulded nylon. This was shown by Arthur L. Gibson and Co., Ltd., Twickenham, Middlesex, who have incorporated nylon units mounted on aluminium rods for rolling shutters or grilles. Besides the saving in weight accomplished by using this method, the grille is extremely strong and comparatively noiseless in operation.

Included in the range of sliding-door gear by Clarke Elland Eng. Co., Ltd., were extruded plastics tracks and graphite-loaded plastics sliders. J. Avery and Co. (Est. 1834), Ltd., showed the Wellfold door, which has p.v.c. hinged panels, and Stop-Gap, a polyurethane foam draught excluder.

Decorative plastics laminates were in considerable evidence and are now being applied to a large number of different backings. It is interesting to note that Formica sales for the first half of the year ending March, 1955, were *five* times the sales for the whole of 1953, which indicates the increasing use and popularity of laminates.

Another popular field where plastics materials are being used to an increasing extent was for floor and wall tiles. Predominantly p.v.c., there were, however, examples of resin-bonded blocks incorporating a variety of fillers, for flooring. Also other thermoplastic materials were being used for wall tiles, Porosan, Ltd., exhibiting a self-adhesive tile.

Syphons and ball floats in polythene, as well as the Lynx moulded cistern, were shown by Shires and Co. (London), Ltd.

Polyester reinforced with glass fibre for roof lights was featured by Ashdowns, Ltd., and Cascelloid. Several varieties of corrugation and colour are available in this material now.

An interesting stand was that of Vinatex, Ltd., who showed examples of decorative masonry cast in moulds made from Vinamold, p.v.c. plastisol. Accurate reproduction at low cost is a feature of this technique, which has been used successfully for the production of more delicate work.

APPOINTMENTS.—Mr. L. A. Rogers has recently been appointed sales promotion manager of Rubber Improvement, Ltd., and its subsidiary companies, Rilex Shoes, Ltd., Rilex Sports Co., Ltd., and British Mouldex, Ltd.

Mr. W. R. Lock, A.I.R.I., who has for many years been chief chemist of Rubber Improvement, Ltd., and associated companies, has now been appointed chief production executive of the company, in which post his responsibilities will include the works, laboratory and developments.

MR. M. R. NEVILLE.—British Industrial Plastics, Ltd., have appointed Mr. M. R. Neville to be publicity manager for the Group. The publicity offices are now centred at Oldbury, near Birmingham.

THE PLASTICS INDUSTRY EDUCATION FUND.—The grants to students which the Trustees of the Education Fund have so far made this year amount to £3,500.

Twelve students from the plastics industry taking science courses at universities or technical colleges have been given monetary awards and others are being lent books. Of the students who completed their courses this year, four obtained honours degrees and three pass degrees in science subjects.

At the Borough Polytechnic, London, seven more boys, after leaving school last September, started the full-time course for the Diploma of the Plastics Institute with the help of bursaries from the Fund. Of the bursary holders who completed the Diploma course last July, six are employed in the plastics industry and two are continuing their studies for the Associateship of the Plastics Institute.

At the Birmingham College of Technology six students hold scholarships from the Fund and are in the second year of the course leading to the Associateship of the Plastics Institute.

The Trustees have also offered a research studentship in Plastics Technology of £300 a year at Acton Technical College and applications for this have been invited.

In addition, the Trustees are financing the publication of monographs by the Plastics Institute.

The Plastics Institute are revising the brochure "Careers in Plastics" for circulation to schools throughout the country and for distribution at the Christmas Lecture for Young People.

"Plastics in the Service of Man"

The following is a list of full names and addresses of companies mentioned in the illustrated feature, "Plastics in the Service of Man," which appears on pages 410 to 412 in this issue:—

62. Christmas

Airfix Products, Ltd., Haldane Place, Garratt Lane, London, S.W.18.
Cellastine-British Celanese, Ltd., Celanese House, Hanover Square, London, W.1.
Clarifoil-British Celanese, Ltd.
Coleman, Cecil, Ltd., 136 Pentonville Road, London, N.1.
Dickinson, John, and Co., Ltd., Apsley Mill, Hemel Hempstead, Herts.
Farringdon Metallic Finishes, Ltd., 362 Goswell Road, London, E.C.1.
Halex, Highams Park, London, E.4.
Injection Moulders, Ltd., Westmoreland Road, London, N.W.9.
The International Bottle Co., Ltd., 140 Park Lane, London, W.1.
Kenure, J. F., Ltd., Faggs Road, Feltham, Middlesex.
Marx, Louis, and Co., Ltd., Trading Estate, Swansea, Glamorgan.
Noma Electric Co., Ltd., The Old Tower House, Coronation Road, London, N.W.10.
Punfield and Barstow (Mouldings), Ltd., Westmoreland Road, London, N.W.9.
Rosedale Associated Manufacturers, Ltd., 11 Upper Grosvenor Street, London, W.1.
Schall Products, Ltd., 34 Cleveland Street, London, W.1.
Spesco (Developments), Ltd., 195 Uxbridge Road, Hampton Hill, Middx.
Witton Moulded Insulation Works of G.E.C., Ltd., Witton, Birmingham.

MEETINGS

December

15th.—Film Meeting. Plastics Institute, London Section, Wellcome Research Institution, 183-193 Euston Road, London, N.W.1.

January

11th.—Cameo Meeting—short papers by section members. Plastics Institute, Yorkshire Section, St. Mark's House, 186 Woodhouse Lane, Leeds. 7.15 p.m.

11th.—Ladies' Evening. Plastics Institute, South Wales and Monmouthshire Section, Angel Hotel, Cardiff. 7 p.m.

"NUCLEAR ENGINEERING."—A monthly journal covering every phase of world industrial production and utilization of nuclear energy and its by-products is to be published by Temple Press Limited. The title of this new journal is *Nuclear Engineering*, and the first issue will be published early in 1956. It will be edited by Mr. E. N. Shaw, B.Sc., Head of the Research Department of Isotope Developments, Ltd., since 1953, and a member of the Nuclear Physics Division of the Atomic Energy Research Establishment at Harwell from 1947 to 1950.

"THE PETROLEUM TIMES."—Temple Press Ltd. has acquired control of Petroleum Times, Ltd., publishers of *The Petroleum Times*, the leading oil journal of the United Kingdom—established in 1899.

Editorial direction and business management of the journal will continue unaltered. The address of the offices will remain unchanged:—Brettenham House, Lancaster Place, London, W.C.2.

TALKING SHOP . . .

Tube Investments Report Out. The company's A.G.M. is to be held in Birmingham on December 12. A copy of the Chairman's (Sir Ivan Stedeford) statement has been circulated in advance. Not unexpectedly after the various announcements during the last twelve months, the statement refers on several occasions to T. I. interests in plastics. Hinxton Hall, Sir Ivan reports, is now in working order, and Dr. Charlesby's Radioactive Research Group is equipped with an electron accelerator, presumably of the van de Graaff type. Mr. J. E. Gordon, the report says, "will study the machinery of the plastics industry, exploit the chemical advances of recent years, and streamline production techniques." Can one assume from this that T. I. contemplate the building of plastics machinery?

★ ★ ★

Faster Skis. From that august scientific weekly *Nature* (issue of November 19), I am able to quote some interesting figures on the performance of skis treated with p.t.f.e. In an article contributed by F. P. Bowden of the Department of Physical Chemistry (Physics and Chemistry of Surfaces) at Cambridge, the descent of a body weighing 168 lb. is given as 61 seconds when using skis treated with Norwegian wax and paraffin. On the same run and weight, the time for p.t.f.e. skis is 42 seconds. Not generally realized is the fact that normal skis only become efficient when sufficient frictional heat has been built up to form a layer of melted snow immediately beneath the ski surface. The fact that p.t.f.e. has inherently an exceedingly low coefficient of friction overcomes this problem, and also gives better results over snow of varying temperatures. I heard some time ago that our Olympic bob-sleigh team may have their runners similarly treated.

★ ★ ★

Copenhagen Trade Fair. The photograph I print here shows the Duke of Edinburgh on the stand of R. H. Windsor, Ltd., at the recent Trade Fair in Copenhagen. He was inspecting a polythene washing-up bowl moulded in Alkathene on the A.P.1044 preplasticizer machine. R. H. Windsor report great interest in their machines in Denmark.

Do It Yourself. The latest gimmick, seen at the Building Exhibition (shown by J. Avery and Co., Ltd.) is a draught excluder sold in 20-ft. coils and consisting of a thin band of polyurethane foam $\frac{3}{4}$ in. and approximately 1/10 in. thick. The undersurface has been sprayed with an adhesive, protected by a paper foil which is removed before application in the same way as elastic bandages. The device is claimed to be excellent for windows and door frames, the only proviso being that the strip must be fixed to absolutely clean surfaces.

★ ★ ★

Flame Resistant Polymers. A symposium was recently held in London, having the above title, and an unexpected guest speaker was Professor M. Stacey, F.R.S., in charge of Organic and Biological Chemistry in the University of Birmingham. His paper was entitled "Prospects for the Application of Organic Fluorine Compounds," and he reviewed the present state of research in a most interesting and lucid way. Birmingham has been for many years a centre of fluorine chemistry and many relatively simple techniques are now at the disposal of the research chemist and the industrialist for fluorine substitution in many common polymers, to give a range of relatively unexplored materials having properties of special interest. Those that have been made and investigated so far at Birmingham are principally of low molecular weights and are therefore of special interest as high-temperature resistant hydraulic fluids and greases. Higher molecular weight materials, or solid polymers, being more difficult to make on the laboratory scale have not yet been fully investigated (except of course p.t.f.e. and p.t.f.c.e.), but their manufacture according to Professor Stacey should not be insuperably difficult.

He concluded his lecture with a plea for greater support for the work being done at Birmingham, by industry. He pointed to the present undesirable situation where the majority of research was being carried out in America (some 32 centres are at present at work on fluorine compounds) and pleaded for closer co-operation with the technologists who would be capable of translating the present theoretical work into pilot plant production. In an attempt to interest the industry, small quantities of various fluorinated polymers, up to about 200 c.c., are to be made in Birmingham and sent round to various manufacturers.

★ ★ ★

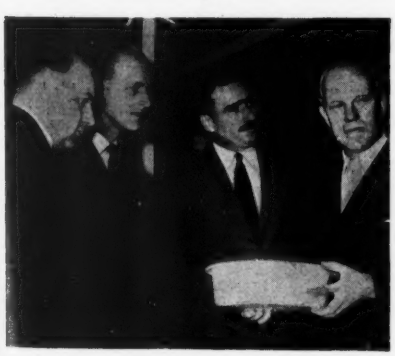
National Press Figure at Institute Luncheon. William Hickey, diarist of the *Daily Express*, was the guest speaker at the annual luncheon of the Plastics Institute (London Section). To illustrate his assault on the "Establishment" (Hickey definition: the small group of intellectuals who think everybody's out of step except themselves), he described three recent news items, the Soho affair, the affaire diplomatique and the affair which we all know about. Controversial, as a writer for the popular Press must be, he defended the freedom of that Press against the Establishment, and after an excellent speech, called for questions. Can he have been surprised to find stalwarts of the Establishment in the audience? At all events, he was cross-examined and even hectored, and was severely taken to task by one eminent editor, having accused the French of letting the Academie Française stultify their language. His audience could not have enjoyed themselves more.

★ ★ ★

Stockholm Plastics Gathering. Each year a strong party from this country visit Sweden for the Swedish Plastics Federation Fall Meeting, some of them for the first time. These I especially envy; I first saw Stockholm from an air liner as we circled to land, and it was a clear and cold night. Below lay the "Venice of the North," a pattern of twinkling lights in the frost, with the lakes reflecting the brilliant sky. I know of no other capital which catches the spirit of Christmas in such a fascinating way, and late November is a good time to be there. You have the feeling that snow there will be the real thing, and not the grey slush we get in London. Perhaps it's the pine forests which hover on the edge of the city, or perhaps it's the Swedish punch, without which no technical meeting can be a real success.

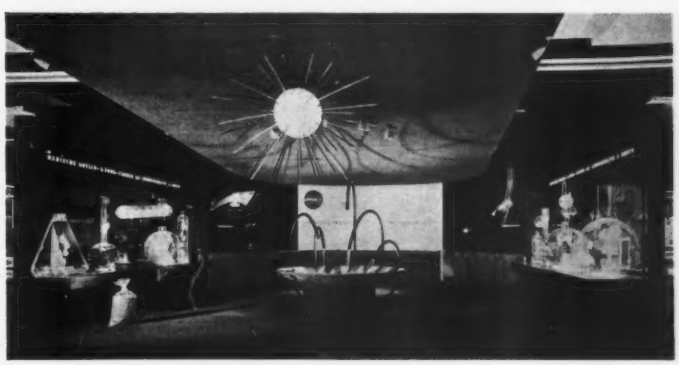
★ ★ ★

Design of Exhibition Stands. Badische Anilin and Soda Fabrik, A.G., have just sent us a photograph of their stand at the Düsseldorf Exhibition. I print it herewith because it seems to me to be the best picture I have yet seen to indicate a typical stand lay-out at this remarkably successful exhibition. The actual construction of this stand is seen on close analysis to be very simple but the effect is spacious and typical of a company manufacturing synthetic materials.



(Left) H.R.H. The Duke of Edinburgh on the stand of R. H. Windsor, Ltd., at the Copenhagen Fair.

(Right) The Badische stand at Düsseldorf.



Hotel Problem Solved. Arthur Tranter, director of Clearex Products, Ltd., and two of his colleagues, travelled with their own

accommodation to Düsseldorf for the plastics exhibition. Here their caravan is seen parked on the banks of the Rhine.

Reinforced Plastics for Army Vehicles? Sir Jocelyn Lucas, M.P., is reported in the *Portsmouth Evening News* to have made the following statement to the Secretary of State for War in the Commons recently: "While thanking my Right Hon. friend for that reply, may I ask whether he is aware that at the British Trade Fair in Copenhagen a plastic car bonnet was shown, that everyone was invited to hit it as hard as possible with a hammer, and that no one could dent it or knock any colour off it?" Can he be referring to the ubiquitous bonnet on the stand of B.I.P. Chemicals, Ltd.?

* * *

International Synthetic Rubber Company. Four of the largest rubber concerns operating in this country have jointly formed a company having the above title. They are Dunlop Rubber Co., Ltd., Goodyear Tyre and Rubber Co., Ltd., Firestone Tyre and Rubber Co., and the Michelin Tyre Co., Ltd. Registered capital of the new company is £100 which, subject to the consent of the Capital Issues Committee, is to be increased to £7 million. Not stated yet is the precise type of synthetic rubber to be made, but production is expected to start in 1958, at an annual tonnage of 50,000.

* * *

Exports Up. A new record is expected to be set up for 1955 in the export of plastics raw materials from Britain. Figures released by the British Plastics Federation show that for the first nine months of this year 62,000 tons of material, worth nearly £16.8m., went overseas, compared with 50,000 tons in the previous period for 1954.

LETTERS TO THE EDITOR

SIR,—I have now read your editorial (November issue, "British and German Plastics Industries") through so many times that I feel I almost know it by heart and I do congratulate you on what is to my mind one of the best editorials ever written on our industry. I can only say that if you can produce editorials of this standard your paper must go from strength to strength. Keep up the good work.

H. A. BROOKS.
British Industrial Plastics, Ltd.,
1 Argyll Street,
London, W.1.

Wiring Clips and Plastic Glazing

SIR,—I wonder if you could help me with the manufacturers' names of wiring clips made of p.v.c. in the form of a Christmas tree as attached sketch. I also

enclose an advertisement from a Canadian magazine which would suggest there is available over there a plastic material which is strong, flexible and as transparent as clear glass, and I wonder if you know of any source of supply in this country of an equivalent material.

ROLLS-ROYCE, LTD.
Motor Car Division,
Crewe.

[EDITOR'S NOTE: The wiring clip, which we have not yet seen, is obviously very flexible to be turned into the slit and to be held by the appropriate "barb" of the "arrow." As for the glazing (the advertisement shows a lovely lady kicking the transparent and elastic sheet with her foot without damage), it seems to be a co-polymer—presumably of the Vybak type made by Bakelite Ltd., and so widely used now for motor-car rear-windows.]

Plant Inquiry

SIR,—I shall be obliged if you could put me in touch with a manufacturer of plastics manufacturing plant, such as compression and injection presses, and extruders.

MRS. KHURSHID KHALID.
c/o M/S Khalid and Co.,
Khalid Manzil,
Khowajgon Street,
Gujrat, W. Pakistan.

Polyester Sheets and Rods

SIR,—We are desirous of getting in touch with manufacturers of polyester sheets and rods for the manufacture of imitation mother-of-pearl buttons.

PLASTIC PROCESS CORPORATION (PTY.), LTD.
P.O. Box 3155,
Johannesburg,
South Africa.

Plastics Sheet Production

SIR,—We have been trying to visualize the conditions likely to arise in the Erinoid process of forming large sheets by compression moulding as described in *Plastics*, September, pages 309 to 313. Apparently the material is loaded on to platens at 20° C., which are then brought up to 175° C., a process which would take about 10 minutes, probably longer if complete temperature equalization through platens and moulds has to be achieved. We assume that this heating up takes place during the period of contact pressure. Then follow periods of intermediate and high pressure during which the maximum temperature is held and the material is formed and finished. To bring the temperature back down to 20° C. probably requires at least six to eight minutes, probably slightly more.

Three major points seem to stand out for questioning in this process.

1. Subject to good temperature control fully thermoplastic products would accept the varying conditions during the heating-up period, but if any materials which undergo any permanent change through being heated are used, trouble may arise due to the unequal onset of cure and period of cure.

2. The press is used to its full capabilities only during the periods of intermediate and high pressure. Before this it is preparing to do work (heating up).

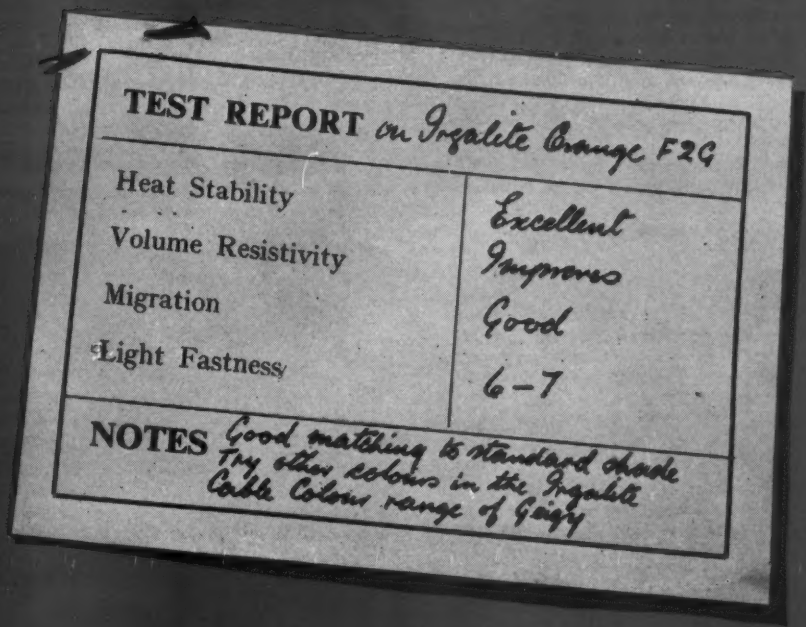
3. The continual cycle of cooling and reheating entails a wasteful use of fuel and because of rapid changes in expansion and contraction, must put a severe strain on all parts of the press and its attachments. The platen surfaces and steam/water joints may be particularly affected.

If two presses were used, one continuously heated and the other cooled, the heated press could work on a very short cycle and production would probably be trebled. The fuel required to maintain the hot press continuously at 175° C. would be about half that used because of cooling and reheating. Continuous changes in expansion and contraction would be avoided.

We should advocate the use on the hot press of platens heated by electrical induction methods. They would provide the greatest area of uniformly heated platen surface. Temperature level and distribution over each platen and all platens would be much more uniform because compensatory loadings and control adjustments could be introduced to ensure it. The press temperature could be quickly and reliably varied to suit different applications.

BEANWY ELECTRIC, LTD.
Rushey Lane, Tyseley,
Birmingham, 11.

Colours for P.V.C. Cables



TEST REPORT on Ingalite Orange F2G

Heat Stability	Excellent
Volume Resistivity	Improves
Migration	Good
Light Fastness	6–7

NOTES Good matching to standard shade
Try other colours in the Ingalite
Cable Colour range of Geigy

Geigy THE GEIGY COMPANY LTD. · Rhodes · Middleton · MANCHESTER

POLYMERIC PLASTICISERS . . .

NON-MIGRATORY...

. . . even under the most severe conditions . . . it is even more true of Diolpate, the new polymeric plasticiser, than it is of penguins. Diolpate literally *does* stay put—ensures your compounds are firmly and permanently resistant to oil, varnish, petrol and solvent extraction.

Compatible with P.V.C., nitro-cellulose and synthetic rubbers, Diolpate is readily compounded by all the usual processes. It confers to compounds ageing qualities of the first order: ensures freedom from embrittlement and imparts high resistance to loss of flexibility . . . is virtually non volatile . . . That is why *Diolpated* P.V.C. is the basis of the insulation used for the production of the famous Permanoid High-Temperature Grade VO Wires and Sleevings.

Diolpate is already being increasingly used in the manufacture of a wide range of products from cable coverings to transparent wrappings. It is well worth while investigating for YOUR products.

★ *Diolpate can help improve your products. Send today for technical data and evaluation samples for test in your own laboratory.*

DIOLPATE and DIOLPATE 105

MANUFACTURED BY BRIGGS AND TOWNSEND LTD.

Sole Distributors in the United Kingdom:—

R. W. GREEFF AND COMPANY LTD., Garrard House, 31/45, Gresham Street, London, E.C.2.

The Properties and Testing of Plastics Materials—Part 2 (Cont.)

Section 9. Viscosity, Plasticity and Flow.

By A. E. LEVER,* A.I.R.I., and J. RHYS,† M.Sc.

Testing methods and results are discussed

Viscosity

IN most of the methods, the time of flow through a capillary is measured and there is a good summary in (1).

A method for determining the specific viscosity of primary vinyl chloride polymers is given (2), the Ubbelohde viscometer being used.

A description is given of the Techne Viscometer (3), which is of the horizontal capillary type, with a device for creating the necessary constant air pressure.

A modified MacMichael Viscometer is used for the study of organosols (4). A note is added on the method used to overcome the errors encountered in measuring thixotropic organosols.

The Ostwald and Falling Ball Viscometers are described (5).

The Sheen Mobilometer, which is an efflux viscometer suitable for testing a wide range of materials (6). Arrangements are made for heating the material under test and maintaining that temperature within close limits.

A simple and rapid method for finding the relative viscosity of a solution, if not too viscous, is to compare the times taken for 25 c.c. to run out of a pipette (7).

A brief description of a conecylindrical rotating viscometer is given (8). Concentrated solutions of polystyrene, cellulose acetate and polyisobutylene were investigated.

The servo-controlled, constant-stress rheometer is described (9). It is suitable for highly viscous materials, and an apparatus for determining the elasticity and viscosity of molten polythene is given (10).

A miniature instrument which can measure the apparent viscosity of rubber and plastics over a wide range of shear rates is discussed (11).

Discussing and investigating the practical importance of determining the viscosity of plastisols (12), a modified Ostwald Viscometer and Hoppler Viscometer are used. Both are described and illustrated.

Viscosity measurements of thermosetting phenolics and silicone resins, using a parallell-plate plastometer, are investigated (13).

Brushability in latex paints correlates with low viscosity at very high rates of shear. Levelling occurs within a few seconds after application and is controlled by the viscosity of the paint, and appears to correlate best with the viscosity measured at very low shear immediately after the sample has been subjected to very high shear rates similating brushing. Devices for doing this are discussed (14).

A method of measuring the Kinematic Viscosity of polystyrene compounds from solution is given (52), using the Cannon-Fenske Modified Ostwald Viscometer. The Ubbelohde (53) or Saybolt (54) Viscometers may also be used. A useful equation for converting in terms of centistokes to absolute viscosity is given (60):—

Absolute viscosity in centipoises = kinematic viscosity in centistokes × s.g. of the solution.

Methods of determining the viscosity of nitrocellulose adopted in British, American and German systems are given (63).

Plasticity

Plasticity is defined as that property which enables a material to be deformed continuously and permanently without rupture during application of a force that exceeds the yield value of the material (15).

If the viscosity of the material is higher than approx. 105 poises, that application of pressure is necessary to cause flow (16).

Plastometers are of four general types: (a) Parallel Plate, e.g. Williams (17) (18). (b) Extrusion, e.g. Rossi-Peakes (19) (20) (21). (c) Rotary, e.g. Mooney (22) (23). (d) Cup Flow, e.g. Ford (24).

Parallel-plate Type (25)

1. **The Williams** (17) (18). This measures the deformation produced by a fixed load in a fixed time. The plates between which the sample is pressed are large.

2. **The Defo Plastometer** is also a parallel plate type, but the plates are quite small, about the same size as the sample. The load required to give a fixed deformation in a fixed time is determined (see also 26).

3. **The Hoekstra Plastometer** (27). In its original form it was not very robust but formed the prototype for the **Wallace Rapid** plastometers (25).

4. **Wallace Rapid Plastometer** (28) has also parallel plates 10 and 11 mm. dia. There is a full investigation of the merits and demerits of this apparatus.

Extrusion Plastometers

1. **Rossi-Peakes Plastometer** (19) (20) (21) (29), which measures the rate of extrusion of a preform into an orifice of standard dimensions under a constant pressure.

By repeating the tests at a number of different temperatures, the temperature at which the material extrudes at a specified rate may be determined. The temperature at which the material flows 1 in. in a period of 2 min., through the standard orifice, is taken as the flow temperature. A preform $\frac{3}{8}$ in. long by $\frac{3}{8}$ in. dia. with the orifice $1\frac{1}{2}$ in. long by $\frac{1}{8}$ in. dia. is used.

2. **The Dillon Plastometer** (29), which operates on similar principles, but differs in constructional details and requires a larger charge of material.

The rate of extrusion through an orifice $\frac{1}{16}$ in. dia. under a pressure of 3,025 p.s.i. is measured over a range of temperatures. The temperature at which the rate is 10 c.c. per minute is determined graphically and is taken as the flow temperature.

3. **The Burns Plastometer** (36) is an attempt to imitate actual moulding conditions by measuring the rate of extrusion of the moulding powder into a number of capillaries of varying diameters, from which an overall plasticity index is calculated. The temperature at which the material has a specified index is taken as the flow temperature.

4. Details of other types will be found:—

(a) **Dullon and Johnson** (31), which is designed for routine control and consists in forcing a standard volume of stock (5.5m1) through a die at 80° C. and determining the time required.

(b) **Kelsey and Dillon** (32).

(c) **Atkinson and Nancarrow** (30) (33). Methods of determining the flow curve of a thermoplastic are discussed (30) and the application of the information derived from this curve to the study of extrusion and calendering.

(d) **Nanson** (34).

(e) **Hayes** (35) has developed a weight-loaded and self-indicating type for p.v.c. It is useful for development and control work but is empirical in nature.

It should be noted that the flow temperature for the same material varies with the method of test, so that this must always be stated when making comparisons.

Rotary Plastometers

1. **The Mooney Plastometer** (22) (23) (29) is a shearing disc plastometer and measures the shearing viscosity in terms of the torque produced when a corrugated disc is rotated at a constant speed in the test material, which is enclosed in a special mould. The temperature at which the material has a definite shearing viscosity is determined.

Some doubt has been expressed as to the reliability of the measurement of the rubber temperature (37).

2. **Piper and Scott Rotation Instrument** (38) is similar to the Mooney but it uses a biconical rotor in place of the disc.

Cup Flow (24)—see section on Flow below.

Other types:—

1. A "cutting-wire" plastometer for viscous plastic materials is described (39). The cutting wire is attached to one end of a torsion balance.

2. A modified Bingham-type Rheometer, known as the **Monsanto Rheometer**, is designed for operating at temperatures up to 260° C. and at pressures up to 2,000 p.s.i. It is not intended for control work (40).

3. **Brabender Plastograph** (41), which measures the torque developed in masticating materials in various special containers.

* Consultant.
† Senior Lecturer in Plastics, National College of Rubber Technology.

General

Using a parallel-plate plastometer, the plasticity grading of fluorothenes is determined (42). The generic term fluorothenes is used to designate the polymers of monochlorotrifluoroethylene.

A knowledge of the flow behaviour of molten thermoplastics is of practical value as it can be used to assess processing performances and classifying the different grades of resin.

An extrusion plastometer is described (43) which is used for polythene. It is similar to the I.C.I. Grader and is less time-consuming than the parallel type of plastometer.

A study has been made (44) of the softness or proneness to flow, of a resin, i.e. "high" plasticity will refer to the condition of a plastic that offers less resistance to flow, and "low" plasticity one that is difficult to work.

The plasticity curve will refer to a curve where plasticity is plotted as a function of temperature at a constant pressure, and is measured in square inches of area of a given size "button" subjected to temperature and pressure. The temperature is given in ° F. and the pressure in p.s.i.

Correlation between different plastimeters for a given material is not easy to determine, and great care should be taken in interpreting figures quoted for different instruments. Comparisons in rubber technology have been published (45) (46) (47).

Flow

Chambers etymological dictionary defines "flow" as "to run as water; to glide smoothly." Both these terms are implied in various specifications which use a temperature or range of temperatures which cause the material being tested to "flow" as defined above. This serves, in general, to differentiate between flow tests and plasticity tests.

This must not be confused with "cold flow" which, in its narrowest sense, is the degree of deformation which a material experiences under its own weight (7).

Thermoplastic moulding materials are covered in (48), in which the Rossi-Peakes Flow Tester is described. Two methods are used: (a) The temperature at which a thermoplastic material attains a definite degree of flow when subjected to a prescribed pressure for a given time in a specified extrusion mould.

(b) The degree of flow which a thermoplastic attains when subjected to a prescribed pressure and temperature for a prescribed time in a specified extrusion mould.

In the case of polystyrene moulding powder, a temperature of 135° C. and a pressure of 1,500 p.s.i. or 500 p.s.i. is recommended. See also (49).

The principal difficulty is the maintenance of the orifice. The polymer contacts the orifice surface, previously unwetted by the polymer, and the surface condition is critical.

Its use over a wide range of temperatures with ethyl cellulose and cellulose acetate has been investigated (50).

A piston plastometer is used (53) for measuring the rate of extrusion of a thermoplastic. When applied to polythene under certain test conditions it yields a "melt index" for that polymer.

This apparatus is not suitable for measurements of flow rate at a high rate of shear (61), but a modified instrument has been devised (55) which operates at pressures up to 2,000 p.s.i. It is, however, time-consuming for recharging. Brief details are given of an "opposed piston" rheometer which overcomes the recharging difficulty.

The Bingham viscometer (54) also operates by a piston loaded with a dead weight, which forces the polymer through an orifice.

The measurement of the melt flow of polythene with a simple extrusion plastometer is described (56). See also (57).

The Cup Flow Test is well known for phenolics (24). The time of flow, measured in seconds, is determined by moulding a test cup in a mould conforming to the dimensions given in the specification. The temperature of the mould should be 163° C. and the pressure 10 tons. The weight of the powder used must be sufficient to give a "flash" of more than 2 grammes. The time of flow is measured from the instant the hydraulic gauge shows a pressure to the instant the "flash" ceases to move. This method has been adopted by the British Plastics Federation for use between moulding material manufacturers and moulders.

Flat Disc Test (58). In this test the mould consists of two flat circular plates maintained at a fixed temperature, with a standard charge of powder which is placed in the centre of the lower half of the mould. A standard pressure is applied and the powder flows out and cures. The average thickness of the disc, measured at definite points round the centre, is taken as the measure of flow.

A simple **Compression Plastometer** (59) for measuring the ability of uncured rubber to flow during moulding processes is described and illustrated. It has two springs that exert a nearly constant force of 8 lb. on the sample held between two circular platens, each ½-in. dia. A dial gauge indicates in mils. the thickness of the rubber sample remaining between the platens at any time after the test has been started. The tests can be made at any temperature by immersing one end in a hot liquid bath. It is accurate and simple to use.

The effect of die-closing time on the flow of a material and carried out on different types of presses is discussed (51). All presses are found to give approximately the same results.

Recently some sonic measurements have been used (54) to follow the viscosity of thermosetting plastics in moulding processes. "Attenuation," which is an index of viscosity, is measured during the actual moulding cycle.

The Olsen Flow Tester (52) was used to identify a high molecular weight polymer, which is capable of absorbing oil, and measuring its suitability for processing. The instrument is used for many other materials, such as resins and plastics, but this particular investigation is limited to gel-free elastomers that tend to crumble and slip in the Mooney Viscometer.

The Severs Extrusion Rheometer (62). This instrument, and a putty consistometer, were used to investigate the consistency of plastigels. The former duplicates the extrusion process, and the latter simulates conditions encountered in moulding.

References

1. Second Report on Viscosity—Royal Aced. Sci., Amsterdam, 1938.
2. A.S.T.M. Spec. D. 1243-52T.
3. *J. Tex. Inst.*, 1949, **40,** A419.
4. *Mod. Plast.*, 1951, **28,** No. 10, 129.
5. B.S. 188-1937.
6. Sheen Instruments, Ltd., Pamphlet SMB1503.
7. *Plastics* (Lond.), 1944, **8,** 258 and 322.
8. *Paint Man.* (Abst.), 1950, **20,** 26.
9. *J. Sci. Inst.*, 1952, **29,** 91.
10. *Kunststoffe*, 1951, **41,** 413.
11. Proc. 2nd Int. Rheo. Conf.—Oxford, 1953, 191.
12. Br. Geon Bull. G4/1948.
13. *Ind. Eng.*, 1953, **45,** 2748.
14. *Off. Digest*, 1953, No. 345, 701.
15. *Nature*, 1946, **157,** 447.
16. Fundamentals of Syn. Polymer Tech.—Elsivier Pub. Co. Inc., N.Y., 1949.
17. *Ind. Eng.*, Apr., 1924, **16,** 362.
18. A.S.T.M. Spec. D.926-47T.
19. A.S.T.M. Spec. D.569-48.
20. U.S.P. 2066016.
21. Elastomers and Plastomers—Elsivier Pub. Co. Inc., N.Y., 1948.
22. *Ind. Eng.* (Anal.), Mar., 1934, **6,** 147.
23. A.S.T.M. Spec. D.927-52T.
24. B.S. 771-1938.
25. Rubber Technology—Butterworth Sci. Pub., 1951.
26. *J.R.R.*, 1949, **18,** 51.
27. Proc. First Rub. Tech. Conf., 1938, 362.
28. *Trans. I.R.I.*, 1953, **29,** 175.
29. *Plastics* (Lond.), 1948, **12,** 470, 528, and 1949, **13,** 15.
30. *Trans. P.I.*, Oct., 1951, 21.
31. *Physics*, 1933, **4,** 225.
32. *J. Appl. Phys.*, 1944, **15,** 352.
33. Proc. Int. Rheo. Conf., 1948, Part 2, 103.
34. *J. Appl. Phys.*, 1950, **1,** 113.
35. Symp. on Mech. Properties of Plastics —Soc. Chem. Ind., Mar. 7, 1952.
36. A.S.T.M. Proc., 1940, **10,** 1283.
37. A.S.T.M. Bull., 1954, No. 195, 45.
38. *J. Sci. Instr.*, 1945, **22,** 206.
39. *Ind. Eng.* (Anal), 1945, **17,** 585.
40. *J. Appl. Phys.*, 1945, **16,** 338.
41. R.A.B.R.M. Bull., 1952, **6,** 55.
42. *Mod. Plast.*, 1953, **30,** No. 8, 125.
43. *Br. Plast.*, 1945, **17,** 94.
44. *I.R.W.*, 1951, **124,** 324.
45. *I.R.J.*, 1953, **125,** 174.
46. *Rub. Chem. and Tech.*, 1945, **18,** 877.
47. Proc. Second Rub. Tech. Conf., 1948, 243.
48. A.S.T.M. Spec. D.569-48.
49. B.S. 1493-1948.
50. A.S.T.M. Bull., Mar., 1948, 70.
51. *Plastics* (Lond.), 1944, **8,** 426.
52. Third Rub. Tech. Conf., 1954, Preprint No. 7.
53. A.S.T.M. Spec. D.445-42T.
54. A.S.T.M., Spec. D.88-44.
55. *J. Appl. Phys.*, 1945, **16,** 338.
56. *Mod. Plast.*, 1953, **31,** No. 2, 146.
57. Symp. on Plastics—A.S.T.M., 1944.
58. *Trans. P.I.*, 1937, **6,** No. 12, 7.
59. *Rub. Chem. and Tech.*, 1954, **27,** 545.
60. A.S.T.M. Spec. D.703-49T.
61. Symp. on Plastics Testing—A.S.T.M., 1952.
62. *Mod. Plast.*, 1953, **30,** No. 6, 130.
63. *J.O.C.C.A.*, 1954, **37,** 63 (No. 404).

The Properties and Testing of Plastics Materials—Part 2 (Cont.)

Section 10. Resilience, Stiffness, Damping

Resilience

RESILIENCE, as a general term, is the ability of a material to return the energy put into it in deformation (1), or expressed in another way, the ratio of energy given up on recovery from deformation, to the energy required to produce the deformation (2). Some of the energy is dissipated as heat. **Hysteresis** is the per cent. energy lost per cycle of deformation and is the result of internal friction. It is manifested by the conversion of mechanical energy into heat (1). **Heat Build Up** is the temperature rise in a body resulting from hysteresis.

Resilience is usually measured by determining the rebound of a pendulum or ball after a single impact.

Temperature affects resilience more than any other factor.

The British Specification for vulcanized rubber (3) gives three methods:—

(a) **The Dunlop Pendulum** (4). (b) **The Lupke Pendulum** (5). (c) **The Dunlop Tripsometer** (6). Details of the methods of calculating the results in terms of percentage rebound resilience are given. The **Goodyear-Healey Pendulum** Type Apparatus (7) is similar to the Dunlop Pendulum. The **Bashore Resiliometer** (8) is used for investigating the temperature effect on plasticized p.v.c. and co-polymers.

The **Bideman Pendulum** apparatus is described (9) and one of the advantages claimed for this apparatus is, that in each test, not only is the angle of rebound of the pendulum after striking the specimen measured, but also the deformation of the specimen from the blow. There is also provided an additional hammer, with movable weights, which permits the testing of materials of different modulus under conditions of constant dynamic deformation.

A hand-indicating device (10) has been developed for measuring the hardness or resilience of foam products. In use, the instrument is pressed against the foam test piece and the values on the Pandux Scale are based on the displacement of a constant load of 250g, over an area of one square centimetre.

In dealing with rubber vulcanisates, there is some interesting information given (6) on the relation between hardness and resilience.

In the **Shore Scleroscope** (11) a steel hammer, with a flattened cone-tip, falls vertically 25.12 cm. delivering 52,316 ergs.

Other types of apparatus are: (a) **Breuil Elastometer,** in which a steel ball 5 mm. dia. falls vertically 25 cm. (b) **Schob Pendulum,** in which a steel hemisphere strikes the specimen horizontally, falling 25 cm., or from nine intermediate points, delivering at a maximum 5 Kg./cm.^{2}. (c) **Van Iterson Pendulum** falls 20.5 cm.

The thickness and size of the test piece will affect the results with rubber vulcanisates. Increase in abrasion resistance automatically results in a decrease in resilience in a regular and predictable manner (6).

The Lupke Impact Resilience apparatus was used (12) to investigate its possibilities for use as a brittleness tester.

Apart from Impact Resilience tests, other methods for determining resilience are:—

(a) Low speed stress-strain loops obtained by loading and unloading a specimen in tension, compression or shear, using low rate of strain and large deformations. As in any hysteresis loop, the area under the loading curve is proportional to the work input, and the area under the unloading curve is proportional to the energy returned by the specimen on retracting (2).

(b) The **Yerzley Oscillograph** is used (13) and measurements in either compression or shear may be made. No significant test can be made on materials having a modulus at the temperature of test, such that a load of 280 p.s.i. in compression or 140 p.s.i. in shear, will not produce at least 10% deformation, or on materials having damping characteristics such that less than three full cycles are produced when obtaining the damped sinusoidal curve.

(c) Forced vibration methods may be used to increase resilience but they are usually employed to determine heat build-up in the specimen. Flexometers for this purpose are described (14) and are known as The Goodrich, Firestone and St. Joe Flexometers. (For further details see Flexing.)

Since resilience is related in a complex way to stiffness, permanent set, creep and other properties, it is impossible to relate resilience data to service performance without considering the other characteristics of the composition.

Stiffness

The *Stiffness* of a plastic is used to define its resistance to "elastic deformation" under low rates of loading (15).

The apparent modulus of elasticity is synonymous with stiffness, and was chosen for comparative purposes in an extensive investigation (39) on the stiffness testing of elastomers at low temperatures. In this study stiffness is defined as "the ease or difficulty with which a material can be deformed and is indicated by the stress required to produce a given strain."

An apparatus is described (16) which measures the load required to maintain a strain, through the use of a strain gauge bridge. Stiffness values for film thicknesses down to 0.002 in. thick can be measured. The apparatus is quick and easy to operate and is capable of detecting small differences in plasticizer content.

A simple apparatus (17) for measuring the stiffness of coated fabrics is illustrated. A strip of fabric is cut and mounted so that a 4 cm. free end acts as a cantilever, sagging under its own weight. The deflection from the horizontal is measured, and the effective bending modulus of the composite proofing can be calculated, if the weight of the test piece is known. As the sample stiffens it may be necessary to hook pieces of wire of known weight into the end of the sample to obtain measurable deflections. The measurements are not extremely accurate.

The bending stiffness is the effective stiffness of the material arrangement under test in bending (18). Simple rearrangement of the same material can give entirely different results, without altering the tensile or compression modulus of elasticity at all.

The **Clash and Berg** method (19) measures the modulus of torsional rigidity over a range of low temperatures (20). Its greatest limitation is its insensitivity at low values of modulus with specimens of convenient thickness, e.g., 0.010 in. to 0.100 in. By the use of a torsion wire for application of the load, it is possible to explore the region from room temperature and higher, even with highly plasticized compounds (21) the apparatus is described.

It proved possible to measure the rigidity moduli of thin cast films of nitrocellulose at room and higher temperatures.

The **Gehman Torsion** apparatus (22) is used for determining the low temperature stiffness of elastomers. A critical evaluation of the torsion wires used is given.

The **Olsen Stiffness Tester** is described (23) and is used for testing various plastics 0.5 in. × 4 in. × sheet thickness as cantilever beams on a 2 in. span (24). A ball-bearing hanger for extra weights is used to increase the capacity of the machine to 22 in./lb. Loading is continued to failure or 90° bend.

Materials tested at low temperatures are held for at least 24 hours at the desired temperature.

A monograph for calculation of stiffness when using this apparatus is given (25).

The theory of stiffness in flexure is discussed (26) and the deformation of a strip supported as a cantilever beam is measured as a function of the applied load. Stiffness is calculated from the slope of the stress v.s. strain curve and specimen dimensions.

A **Cenes du Nony Precision Tensiometer** is used (28) to evaluate the stiffness of elastomers at low temperatures, and an autograph apparatus for measuring the stiffness of non-rigid plastics is described.

The stiffness of non-rigid plastics at various temperatures is determined by a torsion test (29). A flat strip is subjected to torque about its long axis. An apparent modulus of elasticity is calculated from the torque, deflection and specimen dimensions.

Stiffness varies with the rate of deformation (26). A dynamic method has been devised (30) which is operated at audio frequencies, with specimens $\frac{1}{2}$ in. long × $\frac{1}{8}$ in. wide and a few thousandths of an inch thick.

Bending or stiffness tests that require simultaneous readings of load and angle, may be made more readily and accurately, by mounting a rotatable inverse angle scale directly below the fixed load scale of machines of the **Tour-Marshall** design (31). Adapting this principle to the Tinius-Olsen testers is described and illustrated.

In the **Beach Puncture and Stiffness Tester** (32) for paperboard the stiffness test is a measure of the energy required to force a puncture head of designated size and shape, completely through a sample of fibreboard, where a prepared slit is made. The measured value is largely dependent on the stiffness of the board.

Damping

Damping Capacity is a reciprocal function of the resonance amplification factor (33). Materials with a high damping capacity are

capable of dissipating considerable vibrational energy as heat, but this may be harmful, e.g., gas in rubber during flexing.

Plastics possess high damping capacity and low thermal conductivity which may result in high specimen temperature (34). Hysteresis damping should not be associated with weaknesses in a material.

The damping capacity of a material is proportional to the area within the stress-strain hysteresis loop, and thus represents the energy per cycle of vibration dissipated as heat.

Since plastics possess an average damping capacity about ten times that of steel, a plastic part should be considerably less noisy than steel.

The following are various methods of measuring damping: (a) Actual measurement of the stress-strain loop (35).

(b) Measurement of the heat developed during cycle stress. This can be effected by (1) Measurement of the temperature-time curves at the beginning of a fatigue test. (2) Measurement of equilibrium temperature during a fatigue test.

(c) Lateral deflection method.

(d) Measurement of energy input to a specimen-vibrating system excited near resonance by an oscillator. The method of doing this is by means of wattage input to the oscillator motor, deducting losses from the motor inefficiency, bearing losses, etc. A second method is the determination of the energy input to the specimen by reading the force, phase angle, etc., of the oscillator (36).

(e) Measurement of the shape of part of the complete resonance curve of a specimen-vibrating system excited by an oscillator.

(f) Measurement of the rate of decay of free vibrations in a specimen-vibrating system **not** excited by an oscillator.

In general, materials with high damping capacity have high impact strength (37). With high polymers such as p.v.c. and polystyrene, the softening temperature may be taken as the temperature at which the damping is at a maximum.

Two types of machine are described in this investigation in which the applied stresses vary sinusoidally at a rate from sub-audio to audio range of frequencies. The first type is a torsion pendulum from which can be calculated a shear modulus and a mechanical damping term. The second is a resonating reed vibrator which can be used to calculate a Youngs Modulus of elasticity and mechanical damping for rigid films or fibres.

An investigation was made (38) on the relation between damping capacity and stress for polystyrene and other plastics. The following data are given—see table above.

Relation Between Damping Capacity and Stress of Typical Plastics

Type of plastic	Coefficient of stress $C \times 10^{-10}$	Dynamic mod. E, p.s.i., '000	Damp. capacity $\triangle W$ at $0 \leqq 500$ p.s.i. lb./cu. in. per cycle
Cell. acet. butyrate (201MH)	980	250	0.162
Cell. acet. (FM6)	2,550	270	0.156
Poly. methyl methacrylate	540	610	0.0882
Polystyrene (Styron)	147	540	0.0269
Polystyrene (Lustrex Lx.)	98	530	0.0159
Phenolic Laminates			
Army duck base	102	1,330	0.0129
Fabric base	151	1,370	0.0114
Paper base	50	1,430	0.0108
Asbestos base	115	1,560	0.0104
Rayon base	96	1,720	0.0085
Paper base (high strength)	19	3,310	0.0324

References

1. Rubber Technology—Butterworth Sci. Pub., 1951.
2. Neoprene Note Book No. 59, May, 1954.
3. B.S. 903-1950.
4. Proc. First Rub. Tech. Conf., 1938, 830.
5. *Rub. Chem. & Tech.*, 1934, **7,** 591.
6. Rubber in Engineering—H.M.S.O., 1945 (Appendix 3).
7. A.S.T.M. Spec. D.1054-49T.
8. *Mod. Plast.*, 1952, **29,** No. 12, 120.
9. *Rub. Chem. & Tech.*, 1954, **27,** 415.
10. *I.R.W.*, 1954, **130,** 408.
11. Rubber Physical & Chem. Properties, R.A.B.R.M., 1935.
12. *Anal. Chem.*, 1950, **22,** 1545.
13. A.S.T.M. Spec. D.945-52T.
14. A.S.T.M. Spec. D.623-52T.
15. Symp. on Plastics—A.S.T.M., 1944.
16. A.S.T.M. Bull., 1953, No. 192, 40.
17. Rubber Tech.—Butterworth Sci. Pub., 1951.
18. *Chem. & Ind.*, 14.3.1953.
19. *Ind. Eng.*, 1942, **34,** 1218.
20. *Trans. P.I.*, July, 1950.
21. *Br. Plast.*, 1950, **23,** 87.
22. A.S.T.M. Spec. D.1053-49T.
23. *I.R.W.*, 1951, **24,** 443.
24. *Mod. Plast.*, 1943, **20,** No. 8, 87.
25. A.S.T.M. Bull., 1951, No. 173, 59.
26. Symp. on Plastics Testing—A.S.T.M., 1952.
27. *R.A.* (N.Y.), 1943, **53,** 319.
28. *Mod. Plast.*, 1949, **27,** No. 1, 115.
29. A.S.T.M. Spec. D.1043-51.
30. *Prod. Eng.*, 1952, **23,** 130.
31. A.S.T.M. Bull., 1954, No. 196, 40.
32. A.S.T.M. Spec. D.781-44T.
33. *Mod. Plast.*, 1944, **21,** 119.
34. Symp. on Plastics—A.S.T.M., 1944.
35. *A.S.T.M. Proc.*, 1931, **31,** Part 2, 157.
36. *A.S.T.M. Trans.*, 1943, **65,** 87.
37. A.S.T.M. Bull., 1950, No. 165, 48.
38. *A.S.T.M. Proc.*, 1949, **49,** 1119.
39. A.S.T.M. Bull., 1954, 199 (*I.R.J.*, 1954, 127, No. 18, 735).

Fifth Meeting of ISO/TC 61—Plastics

THIS meeting was held in Paris from July 8 to 13. The countries represented were Belgium, Czechoslovakia, France, Germany, India, Italy, Netherlands, Sweden, Switzerland, United Kingdom and U.S.A. The constitution of the United Kingdom delegation was Mr. G. Dring (leader), Dr. H. M. Glass, Mr. H. Warburton Hall, Mr. R. Hayes, Mr. A. A. Tomkins, Mr. C. Wainwright, Mr. P. Welford and Dr. A. H. Willbourn. International bodies represented by observers were the International Electrotechnical Commission, the International Union of Pure and Applied Chemistry, and Salone Internationale della Technica (C.I.M.P.).

The Chairman at the meeting was, as on previous occasions, Dr. Gordon Kline of the U.S.A., and the Co-Chairman was Monsieur Duval, Technical Director of the French Standards organization, who, as hosts for the meeting, made excellent arrangements for its success.

Scope of the Committee. As a result of discussions at the meeting, the Secretariat (U.S.A.) will now put an amended scope forward to the ISO headquarters in Geneva for agreement by the ISO Council. If approved the new scope will allow ISO/TC 61 to deal with specifications for plastics materials and products as well as methods of test and terminology.

Liaison between ISO/TC 61 and ISO/TC 5. The meeting adopted a resolution which said that ISO/TC 61 agreed to the proposed scope of ISO/TC 5/SC 6—Plastic Tubes and Fittings for the Conveyance of Liquids, and nominated Mr. van Wijk of the Netherlands as its representative to ISO/TC 5/SC 6. It further requested that ISO/TC 5/SC 6 should submit its proposals to ISO/TC 61 at the same time as they are submitted to ISO/TC 5.

Liaison with IEC/TC 15. A resolution was adopted that documents of ISO/TC 61 should be sent to IEC/TC 15 (the Technical Committee of the I.E.C. dealing with insulating materials) as soon as they had reached the stage of Draft ISO Proposals.

Draft ISO Recommendations. The Secretariat reported that the following Draft Recommendations had been sent to the ISO headquarters for circulation for approval to all member countries of ISO: (1) Determination of water absorption of plastics. (2) Determination of apparent density of moulding powders which can be poured from a funnel. (3) Determination of apparent density of moulding powders which cannot be poured from a funnel. (4) Determination of acetone soluble matter of phenolic mouldings. (5) Proposal for determination of temperature of deflection under load.

Working Groups. Meetings of all the Working Groups were held and as a result several documents will go forward to the Draft Proposal stage.

The Working Group on Mechanical Strength Properties agreed to combine two Draft Proposals on determination of flexural properties, one dealing with specimens of standard dimensions and the other with specimens of non-standard dimensions. This will go forward to ISO/TC 61 as a Draft Proposal. Other methods under discussion are impact value determination, in which both the Charpy and Izod methods will be covered, and tensile properties.

Next meeting. It was proposed to hold the next meeting during September, 1956, in the Netherlands.

PATENT REVIEW

The following abstracts have been made from specifications at the Patent Office, with the permission of the Controller of H.M. Stationery Office. The country of origin for Convention Applications is shown in parentheses. Complete specifications can be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, price 3s. 0d. each (including postage).

B.P. 737,817. Hand knitting needle. J. J. Robbins. To: Boye Needle Co.

A pair of knitting pins secured to a central flexible body portion composed of a cord of mono-filament nylon.

B.P. 737,855. Bodies comprising a synthetic resin mass having a metal article partly embedded therein. To: N.V. Philips' Gloeilampenfabrieken (Netherlands).

Cracks at points where the article is embedded in the resin are avoided by providing the metal parts with a layer of polyisobutene ("Oppanol" and "Vistanex" are mentioned).

B.P. 737,905. Container for ink and similar writing liquids. R. Mostyn.

With an inside pocket to facilitate economic utilization of the liquid.

B.P. 737,920. Process for the preparation of objects containing felted cellulose acetate fibres. To: Sandoz, Ltd. (Switzerland).

Artificial leather, stencils, patterns, etc.

B.P. 737,929. Plasticizers for vinyl resins and cellulose derivatives. R. E. Field, J. M. Wilkinson, C. P. Albus. To: General Aniline and Film Corp.

Certain liquid polyesters of dicarboxylic acids with a dihydroxyalkane.

B.P. 737,931. Moulding composition and process for making it. To: Richardson Co. (U.S.A.).

A phenol-furfural plus catalyst, neoprene and filler form a storage battery container of great impact resistance.

B.P. 737,932. Accessory for knitting by hand. R. Goodenough (France).

A yarn support which permits knitting simultaneously with several yarns, e.g., of different colour.

B.P. 737,941. Locking together screw-threaded parts. S. S. Stivala (U.S.A.).

A thermosetting polymerizable phthalic acid-glycol polyester composition is applied to the threads of one or both parts prior to assembling them. The composition will harden after assembly by polymerization.

B.P. 737,984. Method of making bags. F. C. Binnall (U.S.A.).

From a continuous web of thermoplastic film stock by spaced sealing under heat and pressure, severing within the sealing area transversely along two lines, finally cutting the web intermediate the two lines to form bags with one end sealed, the other end open.

B.P. 737,998. Anchoring of pillars or wires of ductile metal in sheets or plates. P. J. Madle. To: Elliot Brothers (London), Ltd.

In electronic devices (computing machines) "tag plates" are required, i.e., small insulating supports with a large number of small diameter lengths of wire. The plate is made of a laminated and filled phenol formaldehyde or phenol urea resin ("Paxolin").

B.P. 738,033. Preparation of melamine-formaldehyde syrups. F. P. Grimshaw. To: British Oxygen Co., Ltd.

B.P. 738,036. Stuffed food products comprising a cellulosic casing. To: American Viscose Corp. (U.S.A.).

The casing has a synthetic rubber film adhered to or a film of a copolymer of vinylidene chloride and acrylonitrile or these and similar materials blended together. The application of the coating is the final step after stuffing, cooking, curing and drying.

B.P. 738,037. Non-hardenable insulating material. To: Siemens-Schuckertwerke A.G. (Germany).

The foundation material is, e.g., polystyrene or polyethylene to which a supplementary material is added (0.2 to 10%), which might be polyperfluorethylene. Mineral wax may also be used with a polyamide.

B.P. 738,076. Machines for extruding pipes, tubes and other hollow ware articles, particularly from synthetic thermoplastic material. H. Shaw. To: Bitumex, Ltd.

The feeding screw carries centrally a non-rotating mandrel. This mandrel extends into the die space and conforms to the interior of the extruded product.

B.P. 738,080. Manufacture of regenerated cellulose films. H. J. Ward, E. G. Sanderson, M. A. Maloney. To: British Cellophane, Ltd.

To reduce or even eliminate the tendency for adjacent films to stick together, films are sized with colloidal silica which is rendered electrically neutral by treatment with certain water-miscible non-ionic colloidal reagents.

B.P. 738,096. Preparation of modified alkyd resins. To: American Cyanamid Co. (U.S.A.).

For hard and mar-resistant surface coatings.

B.P. 738,225. Manufacture of articles comprising a frame and a flat-metal plate secured thereto. To: Philips Electrical Industries, Ltd. (Netherlands).

The coefficient of thermal expansion of the plate exceeds that of the frame and the plate is set in the frame heated above room temperature. A thermoplastic or thermosetting adhesive is used. For microphone diaphragms.

B.P. 738,232. Coated abrasives. To: Norton Co. (Canada).

Use of a resinous binder comprising layers, one of which (sizing coat) is a certain ester product, the other (making coat) may be one of the known binders.

B.P. 738,234. Toy buckets. N. Kove. To: Airfix Products, Ltd.

The body portion is injection moulded and shaped to function as a sand mould.

B.P. 738,263. Apparatus for applying strips or bands of coating on sheet or strip material. W. Hesselmann.

The viscous coating (dispersion of synthetic resin) passes from a reservoir through a dispensing slit partially covered by an arcuate foil. The thickness of the foil determines the thickness of the coating.

B.P. 738,265. Printed or otherwise deposited circuits. J. A. Leno. To: Standard Telephones and Cables, Ltd.

A sheet of insulating material carrying the printed or otherwise deposited circuit is placed against a mould surface. The mould is filled with moulding powder and the whole subjected to heat and pressure to form a solid body, in which the circuit is flush with the surface.

B.P. 738,282. Food containers. British Vacuum Flask Co., Ltd., E. Venis.

Two dish parts, the one nested in the other with an insulating air gap in between, and two lid parts, also nestable one inside the other, with an insulating air gap. The parts can be used separately as two containers with separate lids. Phenol-formaldehyde is suggested as a suitable material.

B.P. 738,322. Production of thermoplastic compositions. L. H. Griffiths, W. J. Evans. To: Semtex, Ltd.

A polyvinyl compound (40-60%) and coal tar (add B.P. 581,368).

B.P. 738,325. Dispensers for adhesive tape. To: Tiox - Tinten - und - Klebstoffwerke G.m.b.H. (Austria).

A hand-dispenser with a severing blade.

B.P. 738,347. Apparatus for extruding synthetic thermoplastic materials. To: Vereinigte Deutsche Metallwerke A.G. (Germany).

A single-screw press for extruding polyvinyl chloride or cellulose acetates into tubes, rods and sections. A constriction is arranged in the extrusion nozzle which deprives the passing material of its rotary motion so that an almost straight flow results.

B.P. 738,354. Apparatus for coating cores by extrusion. To: Western Electric Co. Inc. (U.S.A.).

The concentricity of an insulated conductor must usually be closely controlled. This is especially difficult when using cellular plastics insulation (e.g., polyethylene). A plurality of flow-restricting passageways are provided near the die entrance spaced around the filamentary core so as to create high back pressure and prevent undesired expansion before the plastic passes through the die.

B.P. 738,438. Luminous dials for watches. To: Lonza Electric and Chemical Works, Ltd. (Switzerland).

The basis is a plastics sheet (acrylic acid derivative) of about 0.5 mm. thickness.

B.P. 738,440. Protective cover for baby's feeding bottle. H. Senior. To: British Xylonite Co., Ltd.

An inflatable jacket of polyvinyl chloride made from thin sheets by heat sealing.

B.P. 738,461. Continuous-screw press for plastic compositions. J. Kulgen, F. Hilger, H. Hilger, P. Hilger (Joseph Eck and Soehne) (Germany).

A press having a feed section, a mixing section and a section feeding the material to the nozzle. The last section carries an exchangeable box around the cylindrical end of the screw to adapt the press to the material to be treated.

B.P. 738,473. Production of thermoplastic resinous material. To: American Cyanamid Co. (U.S.A.).

Refers to the polymerization of styrene compounds with acrylonitrile without elaborate processing apparatus.

B.P. 738,474. Treatment of polyethylene surfaces. Du Pont de Nemours and Co. (U.S.A.).

To improve adhesion of standard aniline and rotogravure inks and also adhesion to metals, paper, coatings (nylon), etc. The surfaces are subjected to the action of ozone in the presence of an accelerator agent (halogens) in ultra-violet light at a temperature between 150 and 325° C.

B.P. 738,487. Manufacture of moulded articles. P. M. Jacques, K. de Gooreynd, J. Johnson. To: Peterlite Products, Ltd.

Ophthalmic lenses, transparent parts of aircraft structures and other such articles are made from a mixture of materials, one of which is thermoplastic (methyl methacrylate), the other thermosetting (allyl methacrylate). The mixture is converted by polymerization to a stage at which a sheet or block develops sufficient rigidity to be handled but still mouldable under heat and pressure. This is then given the final shape followed by complete polymerization.

B.P. 738,503. Electro-luminescent cells. To: General Electric Co. (U.S.A.).

A fine-line grid of opaque conducting material backed by a coating of transparent plastics or glass. In one embodiment of the invention, the base material is a plastics film with phosphor particles incorporated therein.

B.P. 738,525. Model railway vehicle. S. C. Pritchard.

Axle box and spring moulded integrally from plastics material (nylon polythene).

B.P. 738,536. Method of making insulated electrical conductors. E. R. Cann. To: Sperry Gyroscope Co., Ltd.

A soft wire of circular cross-section is coated with a phenolic base or ethylene-oxide or polystyrene base resin, formed to the desired shape (thickness) by rolling, then again coated with the insulating material.

B.P. 738,542. Spools for magnetic tape recorders. To: Webster-Chicago Corp. (U.S.A.).

The spool heads are circular discs of a resilient translucent plastic exposing the contents of the spools.

B.P. 738,546. Stopper. A. Gidiol.

Head and tubular bulbous body portion integrally made of plastics. An annular recess outside between head and body improves resiliency.

B.P. 738,551. Resinous compositions. To: Philips Petroleum Co. (U.S.A.).

Refers to polyvinyl chloride compositions of improved mouldability.

B.P. 738,660. Oil-modified acidic polyester-ethoxyline resinous reaction products. To: General Electric Co. (U.S.A.).

More flexible, tougher, of greater impact strength they can be stored for long periods.

B.P. 738,671. Floats for float-controlled valves. P. G. Donald, Assoc. Builders Merchants, Ltd.

The bored and threaded boss for mounting the float on the arm of the valve is provided on the inner surface of the float. It can be injection moulded from plastic material.

B.P. 738,678. Adhesive substances. J. Lohmann, G. A. Barth, K. Lohmann (Germany).

The age resistance of adhesives on a synthetic base can be increased considerably by adding alkyl-phenyl sulphides thereto.

B.P. 738,751. Stiffening of portions of shoes and sheet material suitable for use therein. To: British United Shoe Machinery Co., Ltd. Comm. from: United Shoe Machinery Corp.

A toe puff made from a flannel impregnated with a thermosetting phenol-formaldehyde resin (Carbatex 305) and a thermoplastic urea-formaldehyde resin (Carbatex 838).

B.P. 738,763. Method of and apparatus for preforming or moulding thin sheet material. To: Ornapress A.G. (Switzerland).

A thin sheet of, e.g., multi-coloured or printed (with ornaments) textile fibre is impregnated with phenol, urea or melamine-formaldehyde. The impregnated foil is sandwiched between two elastic heated membranes and deformed to the desired non-planar form under fluid pressure while subjected to a heat treatment.

B.P. 738,772. Vacuum flasks. J. E. Wilson. To: Thermos (1925), Ltd.

A combined pourer and sealing ring made from resilient plastic material (polythene).

B.P. 738,779. Process for making elongated cellular articles from thermoplastic polymers. To: Dow Chemical Co. (U.S.A.).

A moulding grade polystyrene with a normally gaseous agent (methyl chloride) is extruded under pressure into a zone of lower pressure in an open chamber at beween 50 and 150° C., then withdrawn from the open chamber.

B.P. 738,784. Homogenizing device for extruding machine. L. M. H. Kraffe de Laubarede.

The working and agitating are brought about by two co-operating shafts with helical gaps and circular grooves through which the (thermoplastic) material is forced to circulate. No counter-pressure develops but the intense working is transformed into heat so that it may even be possible to dispense with special heating altogether.

B.P. 738,794. Resilient tile and method of making the same. To: Armstrong Cork Co. (U.S.A.).

A greaseproof floor tile composed of a filler and a plasticized binder including at least one resin-modified phenolic resin.

B.P. 738,805. Optical projection screens. F. W. Whatling. To: Electrical and Musical Industries, Ltd. (add B.P. 722,614).

Refers to former and pressure roller.

B.P. 738,823. Commutators. B. Camprubi, L. Bonner. To: Hoover Co.

A manufacturing method for a commutator in which the segments are embedded in plastic moulding material.

B.P. 738,824. Adhesive bonding method. B. J. Balfe. To: I.C.I., Ltd.

For bonding shoe uppers (leather) to outsoles (leather or resin/rubber soling) with a composition comprising after-chlorinated polyvinyl chloride and a volatile organic solvent. At least one of the coatings, after drying, is activated by heat before bringing the surfaces together.

B.P. 738,832. Artificial eyelashes and method of making the same. J. Arthur Rank Production, Ltd., W. T. Partleton.

From Nylon suture material.

B.P. 738,883. Vinyl acetate-vinyl chloride copolymers. R. Hurd. To: I.C.I., Ltd.

For coating compositions by blending the copolymers with an alkyd resin modifying the blend with polyisocyanates.

B.P. 738,913. Sliding clasp fastener. E. Loschitz (Germany).

With a stringer edge at each strip attached to the central region of an outermost rib of the strips.

B.P. 738,919. Insoles. F. Stübbe (Germany).

A body of polythene with projections and perforations between the projections on one side and with a cushioning layer of plastic foam on the other side having a fabric layer on its outer face.

B.P. 738,927. Dropper closure. A. Savary (France).

A dome-shaped cap is mounted over the skirted outer flange of a funnel-like tubular part reaching into the container. The bottom end of the tube is sealed with a removable tip. The cap is made of flexible material (e.g. polyethylene), the tubular part may be formed of transparent material with volumetrical graduation.

B.P. 738,974. Packaging of putty-like compositions suitable for use in sealing, caulking, glazing and like operations. B.B. Chemical Co., Ltd., G. R. Lee, W. H. D. McCarthy.

A length of the composition is supplied on a strip of sheet material wound spirally into a coil. It has been found that clean stripping away of the sheet is easy if the sheet material comprises polythene.

B.P. 739,004. Process for preparing condensation products from ingredients comprising urea and formaldehyde. To: E. I. Du Pont de Nemours and Co. (U.S.A.).

For, e.g., paper laminates, crease-resistant cloth, cloth laminates, hot press adhesives.

B.P. 739,015. Means for sealing materials by heat. G. Taunton. To: Wilts United Dairies, Ltd.

"Impulse" sealers for vacuum packages. The heating element is pressed against the material by a thin-walled tube normally flat which is expanded by fluid pressure

B.P. 739,051. Manufacture of moulding materials containing cellulosic particles. H. Pichler. To: A. Nestler.

An aqueous condensate of a heat hardenable resin (phenoplast or aminoplast) is heated to its boiling point and continued to boil until the hot mass is in a "ropey" state (flows freely, but filaments can be drawn off). The hot mass is then mixed with a cellulosic filler (sawdust, wood shavings, cellulose waste).

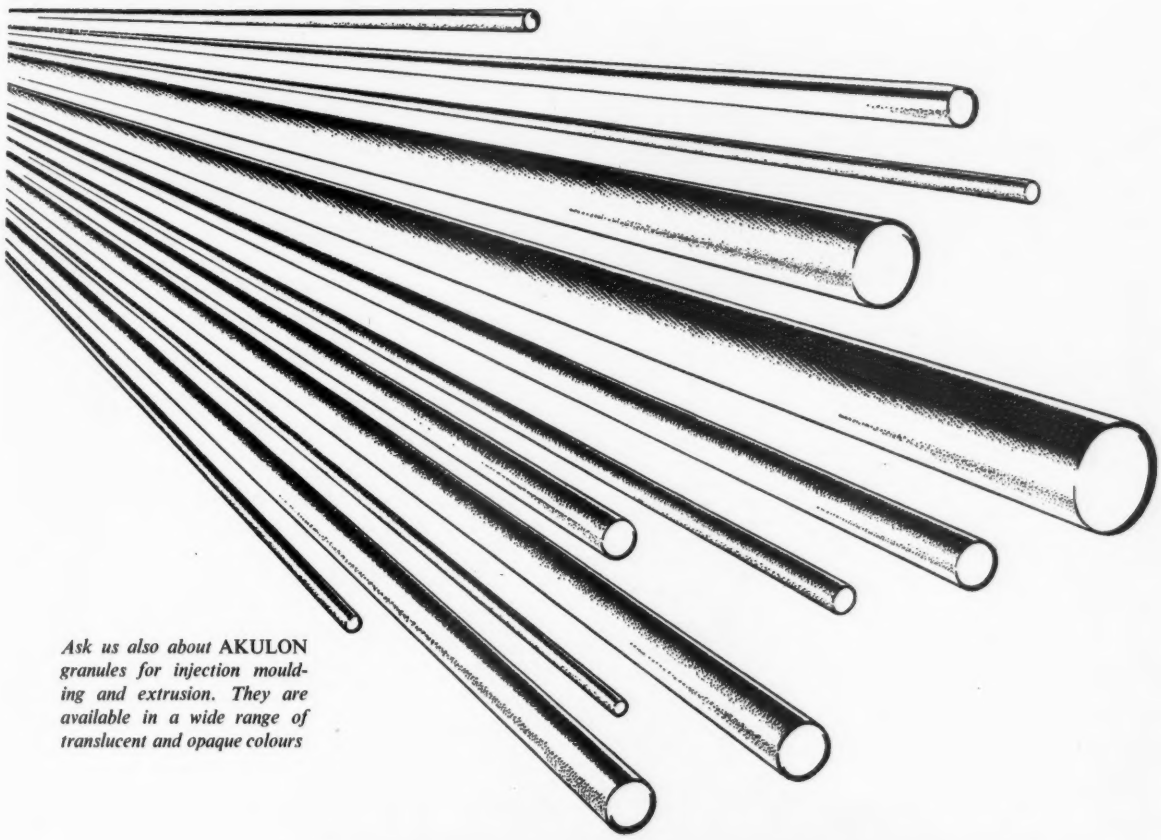
B.P. 739,090. Filled thermoplastic containers. To: Unilever, Ltd. (Netherlands).

At least one heat seal is made by pressing together opposite walls of the filled (polyethylene or polyvinyl chloride) tube by means of sealing jaws which bear in bas-relief characters or designs to appear in high relief on the seal.

B.P. 739,129. Articles made of resin-badge devices. A. V. Raymond. To: A. Raymond.

An annulus of "Rhodoid" or nylon with a plastic head moulded into and around the annulus is secured to a metal nipple having prongs to attach the nipple to textile material.

B.P. 739,129. Articles made of resin-impregnated glass fabric. To: United States Rubber Co. (U.S.A.).



Ask us also about AKULON *granules for injection moulding and extrusion. They are available in a wide range of translucent and opaque colours*

CUT PRODUCTION COSTS WITH THIS VERSATILE INDUSTRIAL NYLON

In its rod form, AKULON offers the best of both worlds. It is ideal for the fabrication of prototypes to allow for economical and speedy modification *before* production moulding with AKULON granules is started . . . AND, it cannot be equalled for the production of manufactured parts which permit little or no lubrication; which demand resilience, resistance to wear, corrosion, heat and permanent deformation, and low cost mass production. We will gladly send you full information on how to get the best from AKULON Rod Material.

AKULON NYLON *Rod Material*

TWENTY SIZES
6 mm. to 150 mm.
in one metre lengths

SOLE DISTRIBUTORS FOR THE UNITED KINGDOM

HERCULES POWDER COMPANY, LIMITED

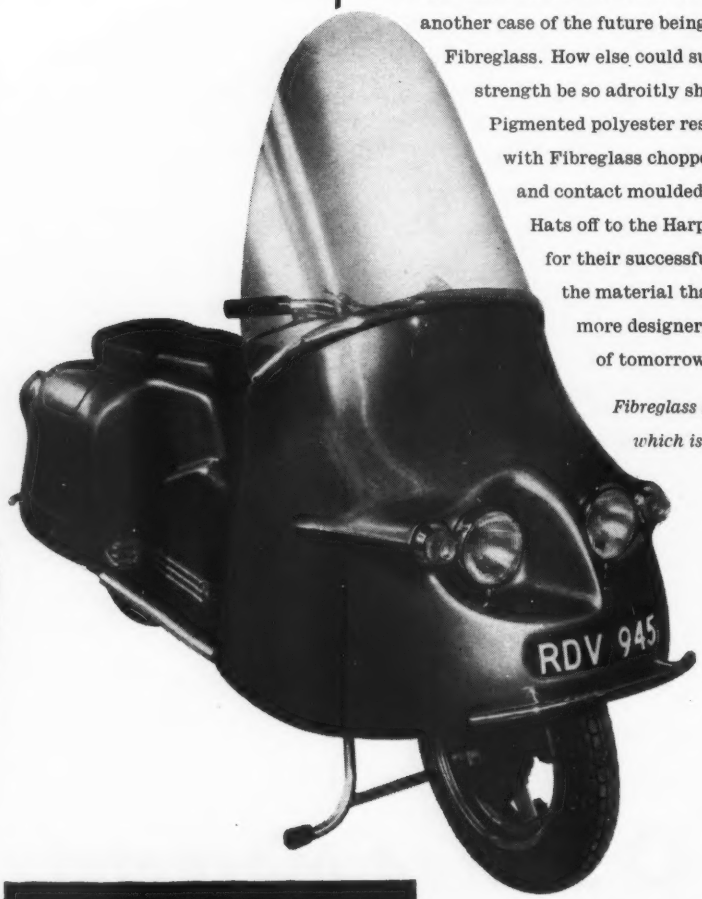
140 PARK LANE • LONDON • W.1 Telephone: MAYfair 8711

Moulding the future . . .

60 m.p.h. and up to 100 m.p.g. on a scooter streamlined like a space ship! Is this the materialisation of our childhood dream—or is it . . . yes, it is: yet another case of the future being moulded in Fibreglass. How else could such sinewy strength be so adroitly shaped!

Pigmented polyester resin was reinforced with Fibreglass chopped strand mat and contact moulded in only *two* sections. Hats off to the Harper Aircraft Company for their successful enterprise—and to the material that is inspiring more and more designers of today and planners of tomorrow!

Fibreglass have an FRP advisory service which is expert, confidential and free.



FIBREGLASS TRADE MARK

the backbone of Reinforced Plastics

FIBREGLASS LIMITED, RAVENHEAD, ST. HELENS, LANCS. TELEPHONE: ST. HELENS 4224

Moulders of the finest toys specify . . .

. . . . reprocessed
Thermoplastic moulding powders by

Polystyrene, Polythene,
Cellulose Acetate, P.V.C.

GRIST PLASTICS

167 VICTORIA ST., LONDON, W.1
Telephone: VICtoria 1414

ONE OF THE DOHM GROUP OF COMPANIES

Temperature control

ETHER

INSTRUMENTS

—at the speed of light!

for ON-OFF CONTROL

ETHER WHEELCO *ELECTRONIC* **"CAPACITROL**

for STRAIGHT — LINE CONTROL

ETHER WHEELCO *ELECTRONIC* **"CAPACILINE"**

Most of the leading British and American Moulding Machines are fitted exclusively with Ether Wheelco Electronic Controls. The "Capacitrol" controls electrically heated nozzle temperatures with much greater speed and accuracy than the mechanically operated type of apparatus and eliminates under and over-shoot.

This instrument (Capacitrol EW 221) is fitted as standard to various Moulding and Extruding Machines.

The Ether Wheelco Electronic "Capaciline" is a proportional controller which will automatically maintain a furnace or other heated body at a set temperature.

There are also many types of Ether Surface Contact Pyrometers designed to measure quickly and accurately, the temperature of dies, etc., and to enable correct moulding temperature to be established.

ETHER LTD TYBURN RD · ERDINGTON BIRMINGHAM 24

Telephone : EAST 0276-7-8

PIONEERS OF INDUSTRIAL ELECTRONICS

HARRIS—*the Plastic Scrap People*

You are assured of fair prices, speedy collections and prompt payments if you offer your

"Perspex" Acrylic
Cellulose Acetate
Cellulose Nitrate
P.V.C. and all other
Thermoplastic Scraps

to

HARRIS PLASTICS (Richmond) Ltd.

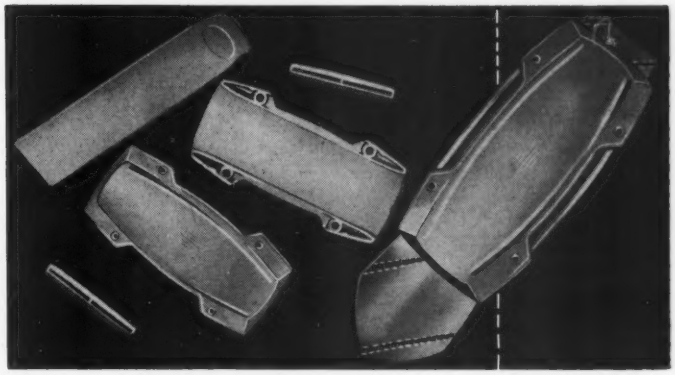
MANOR PARK · RICHMOND · SURREY

Phone: 0028/9

With acknowledgments to John Watts (Sheffield and London), Ltd. and Lambournes (B'ham), Ltd.

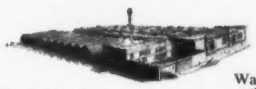
We wouldn't let tie this problem us down!

To the sartorially conscious, the introduction of an efficient tie press will be very welcome. Few moulding jobs are straightforward, and this was no exception either. The manufacture called for a perfect moulding, enabling the finished product to sell on appearance and in a quality suitable for a high-class gift.
With over 45 years' experience we were able to produce a moulding technique which proved highly satisfactory. If your problem is the production of large quantities of plastic mouldings by compression or injection we are waiting to help you.



FOUR FACTORIES AT YOUR SERVICE

E. Elliott LIMITED



Cheapside Works

Walsall Works (Eldon Street)

Victoria Works (Summer Lane)

Walsall Works (Bescott Crescent)

315 SUMMER LANE, BIRMINGHAM, 19. Tel.: ASTon Cross 1156-7-8-9

THE PLASTIC MOULDERS WITH THE ENGINEERING BACKGROUND

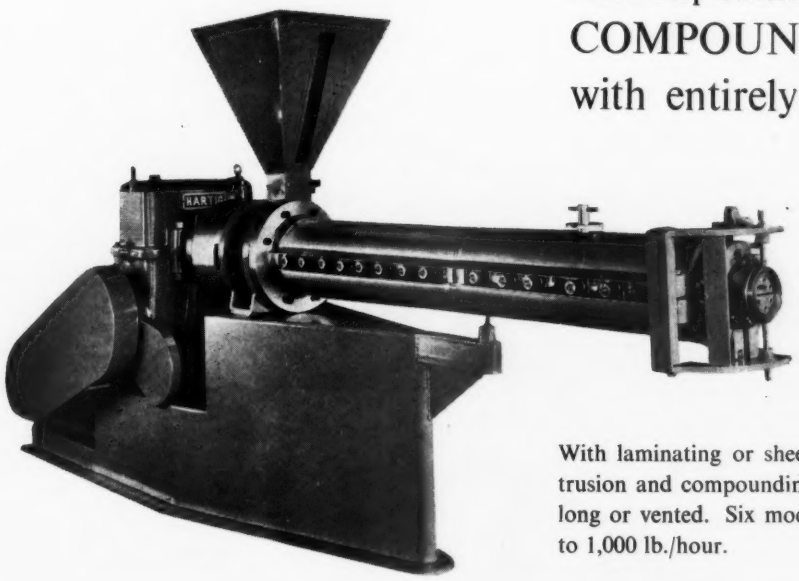
Utilex
CELLULOSE ACETATE
SHEETS and FILMS
UTILEX LIMITED
MILL STREET · KINGSTON-ON-THAMES. TEL.: KINGSTON 1660

Control Knobs
MOULDS
AND
MOULDINGS
by
CASE DEVELOPMENT CO., LTD.
KANGLEY BRIDGE RD. SYDENHAM S.E.26.

machinery from IPL

The Hartig

An important new COMPOUNDER EXTRUDER with entirely new venting device



With laminating or sheeting die, adaptable for straight extrusion and compounding. Barrels available standard, extra long or vented. Six models with nominal capacities from 20 to 1,000 lb./hour.

The range of machinery from I.P.L. includes:

Condux Granulators
Girovinyle Granulators
Pourtier Spark Testers
Fluidflow Screener/Conveyors
Bandera Extruders
Decombe Coilers
Sommer Injection Presses

For full details and demonstration please contact

IPL

INDUSTRIAL PLASTICS LIMITED

LONDON & EXPORT OFFICE 93 Regent Street, London W.1
Telephone: REGent 3146/9 Cables: Ipla London
MACHINERY SHOWROOMS 93 Harrow Road, London W.2.

Ferguson's

ASBESTOS FLOCK

MOULDING COMPOUND A 578/1

This material has strength, freedom from warping and can be preformed and moulded without difficulty. It also has the ability to absorb local shock by bruising.

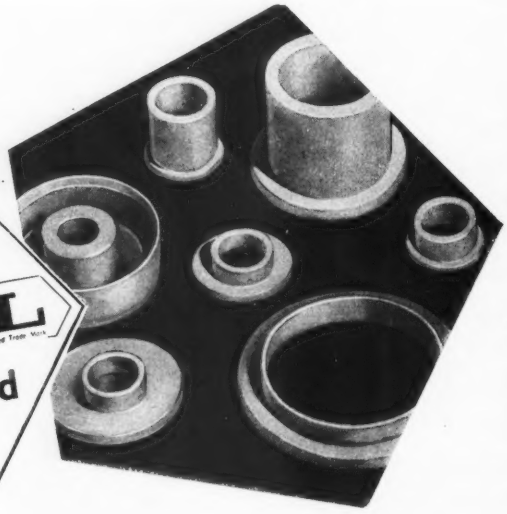
You're right with 'NESTORITE'

ASK FOR A 578/1 -
ASBESTOS FLOCK MOULDING COMPOUND
MADE IN BLACK, BROWN & NATURAL BY . . .

JAMES FERGUSON & SONS LTD

PRINCE GEORGE'S ROAD · MERTON ABBEY · LONDON · S.W.19
Tel.: MITCHAM 2283 (5 lines) Grams: NESTORIUS, SOUPHONE, LONDON

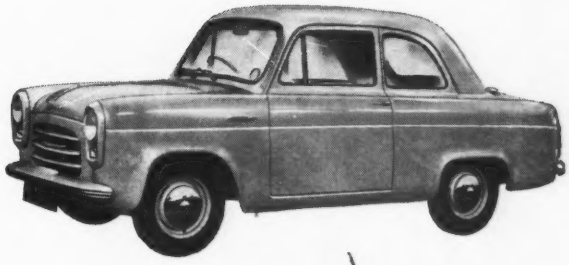
Bushes & Bearings
NYMOL
precision moulded in Nylon

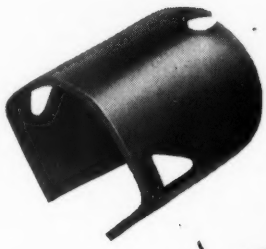


★ Nylon as a new engineering material, possesses, in high degree, the merits of Low Friction Coefficient, High Abrasion Resistance, and Resilience. In many cases it can also show appreciable cost advantage.

Plastic Engineers Limited

TREFOREST, GLAMORGAN
Telephones: Treforest 2371/2





that's fixed that!

101 Spire speed nuts are used in the Ford Anglia. Compared with conventional bolt and nut methods which involve welding, riveting and threaded inserts, Spire parts speed up the assembly enormously—especially in blind locations. They hold fast under vibration and save a good deal of weight.

There are over 200 different types of Spire fasteners. Here are the main types used on the Ford Anglia :— SNJ nuts retain the front wings and grille casing; SNU nuts secure the window channels, instrument cluster and sun vizor; SNO nuts fix grille bars to grille casing, and head lamps and parking lamp bezels to front wings; SFP fixes fasten the lamp lenses; SFR fixes and SCL clips retain the badges and moulding. All these jobs, and many others besides, can be done quicker, cheaper and better by Spire.

Spire SPEED NUTS—FASTEST THINGS IN FASTENINGS

Enquiries to:
SIMMONDS AEROCESSORIES LTD.
Byron House, 7-8-9 St. James's Street, London, S.W.1.
Head Office and Works: Treforest, Pontypridd, Glamorgan.
Also BIRMINGHAM, STOCKHOLM, COPENHAGEN, MELBOURNE, SYDNEY, JOHANNESBURG, AMSTERDAM, MILAN & NEW YORK
A MEMBER OF THE FIRTH CLEVELAND GROUP

CRC 403

BETTER

TRY '600'

FIRST !

for
PLASTICS MACHINERY OF ALL TYPES

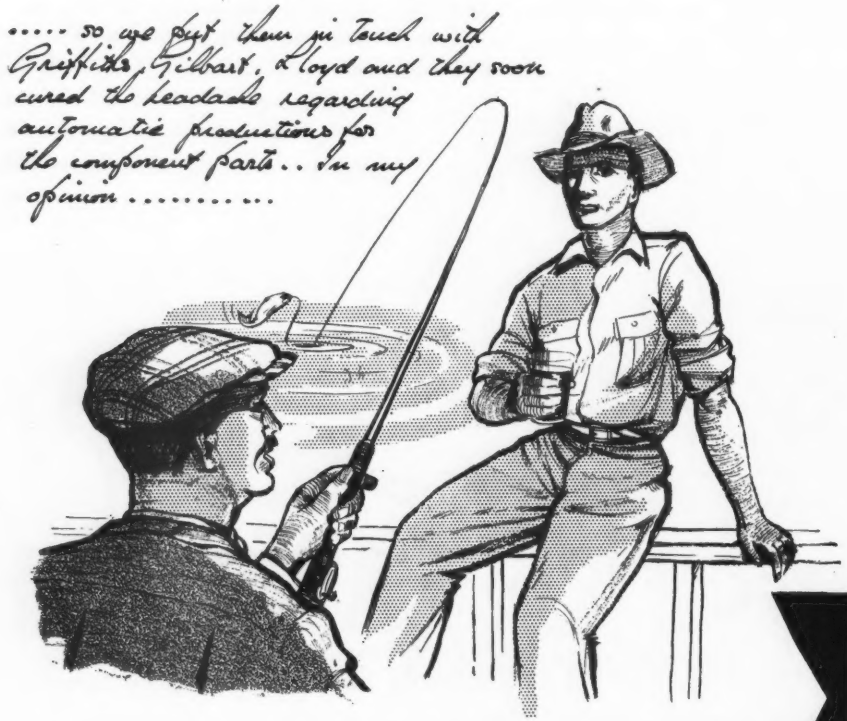
Including:
Two-roll Mixing Mills · Pre-form Tabletting Machines · Hydraulic Compression and Injection Moulding Presses · Extruders Pumps and Accumulators · Vulcanising Pans

Our range includes: Power Plant · Boilers Lifting and Mechanical Handling Equipment Protective Clothing

WOOD LANE, LONDON, W.12
'Phone: Shepherds Bush 2070. 'Grams: Omniplant, Telex, London
STANNINGLEY, Near LEEDS
'Phone: Pudsey 2241. 'Grams: Coborn, Leeds

GEORGE THE 600 GROUP OF COMPANIES **COHEN**
SONS AND COMPANY LIMITED
Established 1834
And at Kingsbury (Nr. Tamworth) · Manchester · Glasgow · Swansea · Newcastle · Belfast · Sheffield · Southampton · Bath

P/5412/HP68


..... so we put them in touch with Griffiths, Gilbart, & Lloyd and they soon cured the headache regarding automatic productions for the component parts.. In my opinion .....

For quick service at the right price get in touch with—

GRIFFITHS, GILBART, LLOYD & CO. LTD.,

Empire Works, Park Road, Birmingham, 18.
Telephone: NORthern 6221.

G·G·L

Capstan and automatic work, and sheet metal pressings, any metal, any finish, any quantity.

For the production of

EXPANDED RUBBER

Natural, or copolymer reinforced

You must have the most efficient blowing agents—

* **GENITRON B.S.H.**

AND

* **GENITRON O.B.**

* *'Genitron' is the registered trade mark of Whiffen & Sons Ltd.*

For further information, write to:

WHIFFENS

Industrial and Pharmaceutical Chemical Division of Fisons Ltd.

fine chemicals for industry

WHIFFEN & SONS LTD · DEPT. Y/BA6 · NORTH WEST HOUSE · MARYLEBONE ROAD · LONDON · N.W.1

Tel: Paddington 1041/9 · Grams: Whiffen, Norwest, London

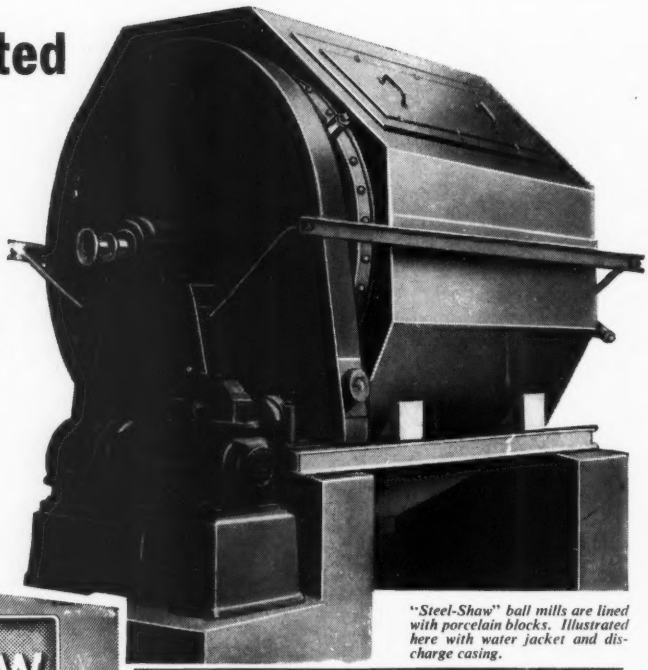
STEEL-SHAW jacketted

BALL MILLS

with porcelain linings

Successfully used for many years in the plastics industry, Steel-Shaw Ball Mills are your wisest choice for the grinding of plastic powders of all types. Speed, ease of operation, and efficiency, are but some of their attributes, which, from the manufacturer's point of view, mean increased productivity and top-quality products.

Robustly constructed and capable of staunchly withstanding the strain of constant use, Steel-Shaw Mills can be supplied in various sizes and fitted with discharge casings and insulated cooling jackets, if required.



"Steel-Shaw" ball mills are lined with porcelain blocks. Illustrated here with water jacket and discharge casing.

There's a STEEL-SHAW *answer to YOUR problem*

Write now for illustrated brochure

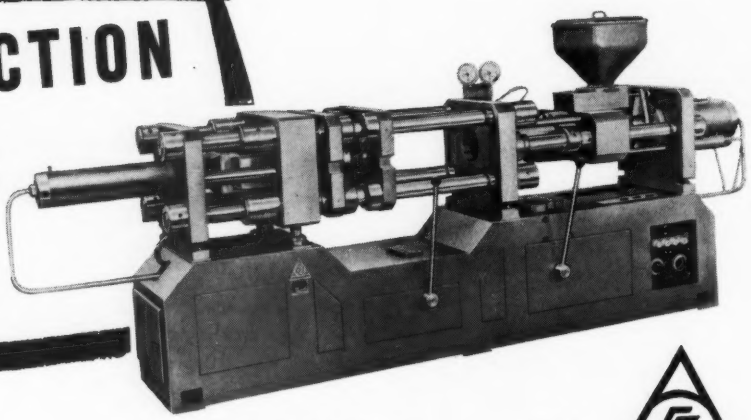
STEELE & COWLISHAW LIMITED

Head Office and Works: DEPT. 27
COOPER STREET, HANLEY, STOKE-ON-TRENT
Phone: Stoke-on-Trent 22109
London Office: 329 High Holborn, W.C.1 *Phone:* HOLborn 6023

sc/2999

E H 400—AN OUTSTANDING ECKERT & ZIEGLER MODEL

10 OZ INJECTION MOULDING MACHINE



- ★ Oil hydraulic or pressure water operation.
- ★ Extremely robust construction.
- ★ Every part carefully machined.
- ★ Fast operating cycle.
- ★ All parts easily accessible for simple maintenance.
- ★ Spare parts quickly obtainable.
- ★ Semi-automatic or fully automatic.
- ★ Moderate in price.

★ Weight moulded per shot in Polystyrene	10 oz.
★ Approx. Plasticising Capacity per hour dependent on material and mould construction	26.5-31 lb./hr.
★ Total force on injection plunger	40 tons
★ Size of Die Plates	23.2 x 19.3 in.
★ Clearance between columns	13.8 x 9.8 in.
★ Max. Mould Opening Stroke	18.8 in.
★ Max. Projected Area, dependent on material and mould construction	124 sq. in.
★ Max. Mould Locking Force	200 tons

EZ SPRITZGUSS

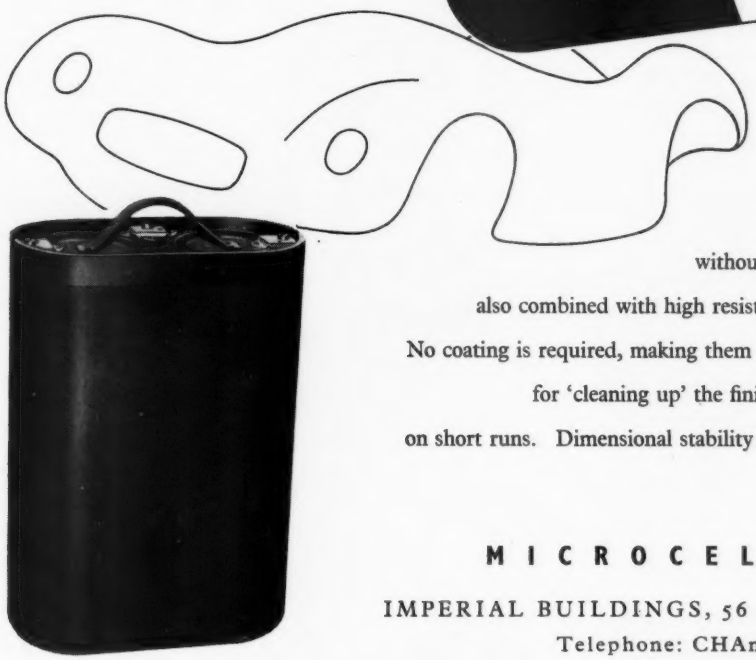
SOLE AGENTS

ARPAL

ARPAL (ENGINEERS) LIMITED

ABFORD HOUSE, WILTON ROAD, LONDON. S.W.1. Tel.: VICtoria 0783, 2785, 4880

mould it in **MICOR** *GLASS REINFORCED PLASTIC*



No ordinary plastic, MICOR glass-reinforced mouldings are hard and tough—impact strength as good as metal, and flexural enough to take blows without denting. Their extremely light weight is also combined with high resistance to moisture, corrosion and chemicals. No coating is required, making them ideal for outdoor use, and there is no need for 'cleaning up' the finish after moulding—an important economy on short runs. Dimensional stability makes them proof against fire and weather warpage. Full details on request.

MICROCELL LIMITED

IMPERIAL BUILDINGS, 56 KINGSWAY, LONDON, W.C.2
Telephone: CHAncery 3424 (10 lines)

PCL

PURE CHEMICALS LIMITED
PLASTICS DIVISION

FERROPERM A

(Ferro's "Permyl A" now manufactured under exclusive licence by Pure Chemicals Ltd.)

THE COMPLETE ANSWER
TO THE STABILISATION OF
HEAVILY FILLED VINYL FLOORING COMPOUNDS

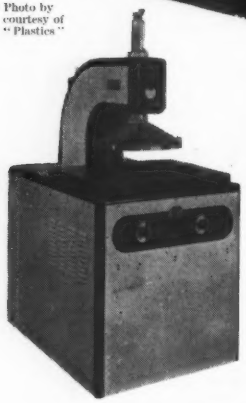
Light Stability
Lowest Volume Cost
Completely Free from Sulphur Stain
Inhibits Discolouration Due to Asbestos and Clays

PURE CHEMICALS LTD · PLASTICS DIVISION · KIRKBY INDUSTRIAL ESTATE · NEAR LIVERPOOL · TEL: SIMONSWOOD 2875

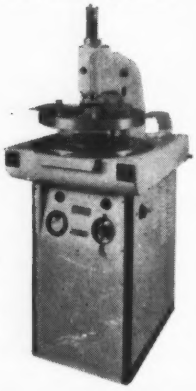
Production economy demands

RADYNE

Photo by courtesy of "Plastics"



Almost any goods which are fabricated from P.V.C. sheeting can be made on RADYNE welders. RADYNE engineers will be happy to advise on your individual problem.

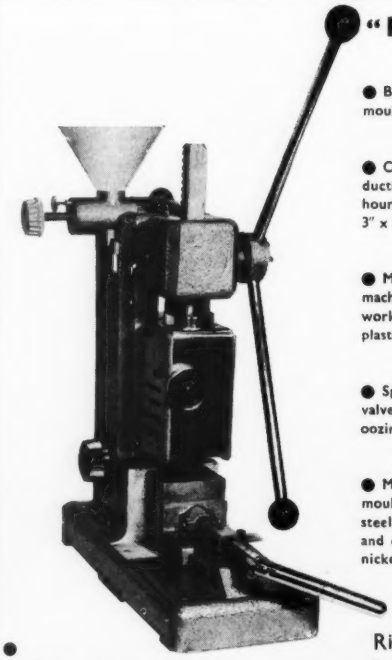


The Press Welders illustrated have outputs of over 6 kW and 3 kW respectively and are two recent models from the very comprehensive range of RADYNE Plastic Welders. Full particulars and illustrated colour brochures supplied on request.

radio heaters ltd

WOKINGHAM · BERKS · ENGLAND

"PEPCO"



- Bench-type injection moulding machine.
- Capacity ¾ oz. Production rate 120 per hour. Mould dimensions: 3" x 3" x 2".
- Most versatile machine suitable for working all thermoplastics including *nylon*.
- Special "non-drip" valve fitted, preventing oozing from the nozzle.
- Most comprehensive mould service in stainless steel, nickel chrome steel and electro-formed hard nickel tools.

It is with considerable pride that we present our new model—an efficient bench-type machine which provides the answer to many day-to-day problems in industry.
The simplicity of operation, coupled with the low cost of moulds, makes this the most versatile machine of its kind on the market.

Ring TER 9648 for particulars

Manufactured by

PEPCO LTD.

21, SKINNER ST., E.C.1

The best in printed plastics

PRINTING
ENGRAVING
FABRICATING
MACHINING
SHAPING
H. F. WELDING
PLASTICS
For All TRADES

ESTABLISHED 1911

U.K. PLASTICS LTD.

Associated Company: CELLULOID PRINTERS LTD.
KINGSTON BY-PASS, SURBITON, SURREY.
Phone: ELMBRIDGE 2814/5.
Grams: CELLUPRINT, SURBITON.

L7391B

KM

Plastics MOULDINGS

Whatever your requirement in plastics moulding — consult K.M. Our engineers are available to examine your needs and offer reliable advice.

KENT MOULDINGS

PROPRIETORS HOLSTER BRANDES LIMITED

FOOTSCRAY · SIDCUP · KENT Tel.: Footscray 3333

AN ASSOCIATE

KM FOR MOULDINGS THAT MATTER

PIGMENTING TYPES

BASIC LEAD CARBONATE
—specially prepared for P.V.C. Supplied only as dispersed paste with Plasticisers to choice.

DIBASIC LEAD PHOSPHITE

TRIBASIC LEAD SULPHATE

A complete system available for heat, light and dielectric requirements

Stabilisers for P.V.C.

TRANSLUCENT TYPES

LEAD SILICATE

DIBASIC LEAD STEARATE

LEAD STEARATE

CADMIUM STEARATE

CALCIUM STEARATE

BARIUM STEARATE

LITHIUM STEARATE

With the exception of White Lead (Basic Lead Carbonate), these Stabiliser/Lubricants are supplied dry, or as non-settling dispersions which facilitate easy mixing and efficient intimate contact with P.V.C.

ASSOCIATED LEAD

MANUFACTURERS LIMITED

SPECIAL CHEMICALS DIVISION, CRESCENT HOUSE

NEWCASTLE UPON TYNE 1, ENGLAND

ASSOCIATED LEAD PRODUCTS

Any METAL

Any GAUGE

Any MESH—

Made to an almost limitless range of specifications, 'Harco' Woven Wire provides a satisfactory solution to all screening and filtering problems.

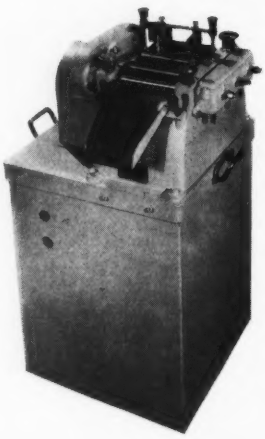
'Harco' Woven Wire

ensures accurate control of quality, and maximum output over prolonged periods of service.
If desired, 'Harco' Wire Cloth can be supplied in non-corroding metals and alloys.
Please ask for Catalogue No. PS 269.

Harvey

G. A. HARVEY & CO. (London) LTD.
Woolwich Road, London, S.E.7. (GREenwich 3232, 22 lines)

with the new sliding centre roll



The latest feature of Pascall Triple Roll Mills is the new and simplified method of roll control—the sliding centre roll. Only two controls are used in place of the usual four, and clearances between the rolls are automatically aligned and set simply by adjusting the two front controls.

The new method of roll control is simple, effective and a real time saver. Demonstrations of the new method can be seen at our Test Station without obligation.

Write or telephone Paddington 7236 for list C.3212

PASCALL

ROLLER MILLS

THE PASCALL ENGINEERING CO., LTD., 114, LISSON GROVE, LONDON, N.W.1

For any of these materials . . .

- Acetate Sheeting
- 'Bexoid'
- 'Crinothene'
- 'Perspex'
- 'Rilfoil'
- 'PVC' Sheeting
- Polythene
- Lampshade Parchment
- Plastic Coated Papers
- 'Mistic' Adhesive

Samples and prices of these materials gladly sent on request.

speak to Spicers

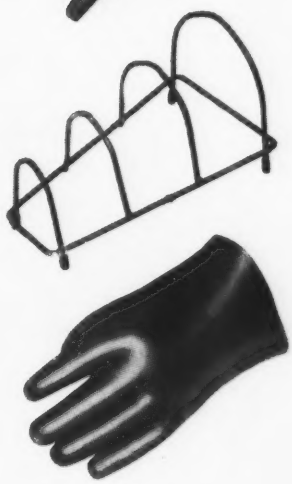
SPICERS LIMITED (*Plastics Department*)
19 New Bridge St · London EC4 · Tel: Fleet Street 4211

OXYTHENE

Investigate versatile VINYL PLASTISOLS with

The versatility of VINYL PLASTISOLS lends itself to many wide and various applications.
The Horwitch Smith organization, whose laboratories are constantly seeking new methods of application for these PLASTISOLS, serves many industries and trades throughout the world.
Coated Textiles, Dip Coating, Slush Moulding, Spraying, Electrical Insulating, Wire Coating, etc., are only a few ways where VINYL PLASTISOLS "fill the bill".

Perhaps we can be of service to you— why not contact us to-day?



HORWITCH SMITH & CO. LTD.
42, LOWER LOVEDAY STREET. BIRMINGHAM. 19.

Intricate moves—and mouldings by Hellermann

As you will see from the small range illustrated intricate injection mouldings present no difficulty to Hellermann. Be it a simple panel button in p.v.c. or a difficult moulding in translucent nylon with steel and brass inserts for a Coil Former, you will find Hellermann can and will produce them in quantity.

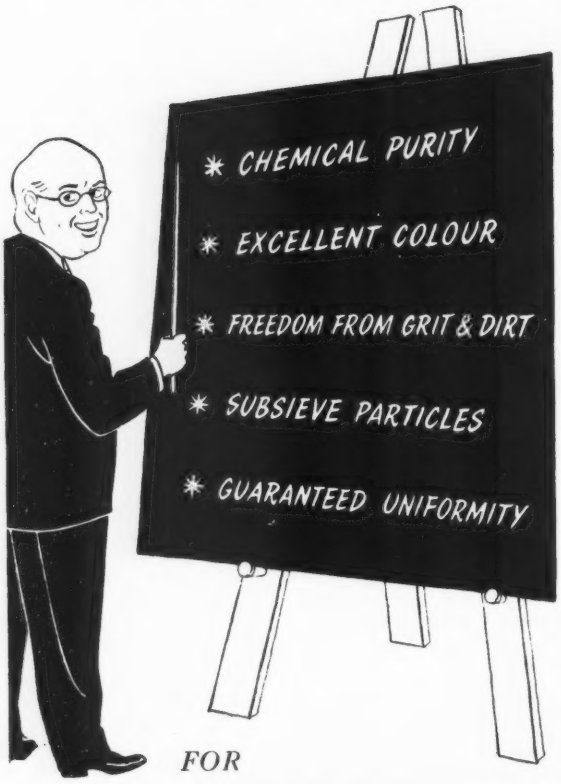
Full details of these and other Hellermann products readily available on request.

Hellermann

HELLERMANN LIMITED, CRAWLEY, SUSSEX. Tel.: Crawley 2000/1/2/3/4.

STURGE

PRECIPITATED CALCIUM CARBONATE



FOR

P.V.C. COMPOUNDS
P.V.C. PASTES
POLYESTER RESINS
EPOXIDE RESINS

Grades Available

CALOFORT (ultrafine, "activated" stearate-coated and uncoated, with ultimate particle size below 0.1 microns)

CALOFIL (low oil absorption, surface-coated and uncoated)

CALOPAKE (high oil absorption, high opacity, surface-coated and uncoated)

STURCAL (medium oil absorption in a wide range of particle sizes)

Write for Technical Leaflets to:
JOHN & E. STURGE LIMITED
1 Wheeleys Road · Birmingham 15
Telephone: Midland 1236/7
Manufacturers of fine chemicals since 1823

STURGE PRODUCTS

PCC 14

Elm Plastics LIMITED

Solely Moulders to the trade, Tool-makers, Injection Moulders, Slash Moulders, offer capacity from 1 to 16 oz. in Styrene, Cellulose Acetate, soft, semi-rigid and rigid P.V.C., Alkathene and Diakon. Virgin materials only.

Elm Plastics Limited
RAINHAM, GILLINGHAM, KENT
'Phone: Rainham, Kent, 81447

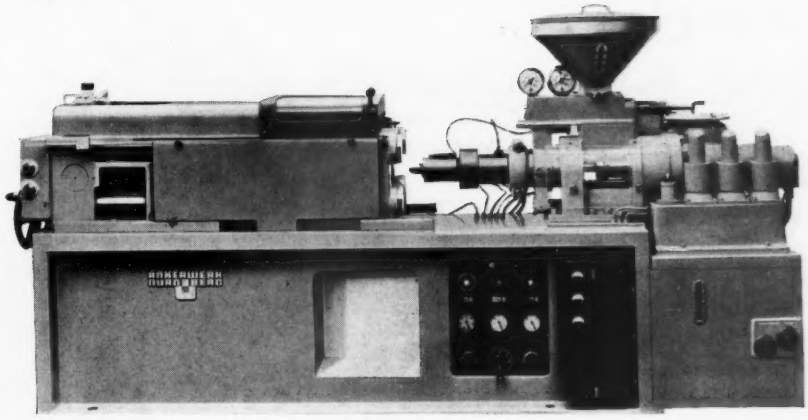
Are you buying these

If you are not, may we send you a testing sample? You will then appreciate the true texture and high quality of Haigh's Stearines and will be able to test for yourself the accuracy of their melting points. Let us have details of your production needs and we will be pleased to submit samples and prices.

HAIGH
FOR A1 QUALITY

JOHN HAIGH & COMPANY LIMITED
CLAYFIELD OILWORKS · SLAITHWAITE · YORKS
Telephone: SLAITHWAITE 266-267
ESTABLISHED 70 YEARS
JH/S6

ANKERWERK NÜRNBERG



For details please write to :
Sole Selling Agents for U.K. and Commonwealth

Aldersley AGENCIES LTD.

TETTENHALL · WOLVERHAMPTON · TELEPHONE: WOLVERHAMPTON 52071 (3 lines)

FAST CYCLING, FULLY AUTOMATIC
INJECTION MOULDING MACHINES
OF ADVANCED DESIGN
4-20 OZ. CAPACITY

Redifon

OFFER THE MOST COMPLETE
RANGE OF WELDERS AND PRE-HEATERS
IN THE WORLD

Redifon are in the forefront of every important development in this important field. Welding and embossing equipment, from 100 watts to 25 kW. is supplied for making everything from button holes in garments to complete car seats. Pre-heating equipment from 350 watts to 25 kW. Save money . . . increase profits . . . by these up-to-the-minute services to Industry.

EQUIPMENT
FOR ALL BRANCHES OF THE PLASTICS
AND ASSOCIATED INDUSTRIES

Industrial Electronics Division
REDIFON LTD., BROOMHILL RD., LONDON, S.W.18. Tel: VANdyke 7281. *A Manufacturing Company in the Rediffusion Group*

Take a long hard look at Deeglas . . .

Better mouldings are *inevitable* when you let Deeglas Chopped Glass Fibre Mat provide that *extra* strength needed to make plastic mouldings stronger and lighter. For Deeglas, in addition to being easy to handle and simple to mould, has outstanding tensile strength — distributed evenly throughout the plastic because of the constancy of density and fibre found in Deeglas mat.
Available as rovings, chopped fibre, or cloth, Deeglas is worth looking into if your problem is how to put strength into your plastics.
And, by the way, Deeglas is now available with a superior moisture-resistant Silane size.

Deeglas
GLASS FIBRE MAT

GLASS YARNS AND DEESIDE FABRICS LIMITED
CRAVEN HOUSE, 121 KINGSWAY, LONDON, W.C.2. ENGLAND Tel: CHAncery 7343

NOW AVAILABLE

Allyl Methacrylate Monomer

IN LIMITED QUANTITIES

Enquiries to

PETERLITE PRODUCTS LTD

24-28 LOMBARD ST LONDON E C 3

Highly accurate
YET LOW IN COST

TEM-CON

The Electronic System of
TEMPERATURE
AND HUMIDITY
CONTROL

Sole manufacturers and Patentees

P.A.M. LTD · MERROW · GUILDFORD · SURREY

ONE OF THE GROUP OF COMPANIES ASSOCIATED WITH THE SOUTHERN AREAS ELECTRIC CORPORATION LTD.

Injection Mouldings

For Trade and Industry

Let us undertake your mouldings, we can offer you a complete service from design and manufacture of tools to the finished article.

QUALITY, RELIABILITY & SERVICE

Halifax 81459

Morris

MANUFACTURING CO. (HALIFAX) LTD.

17, Burnley Road, Waterhill,
Sowerby Bridge, Yorkshire

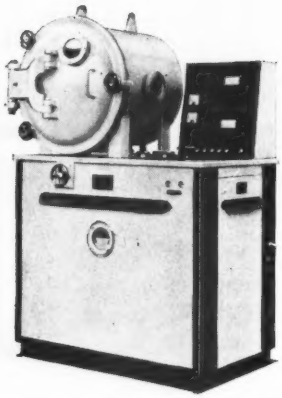
Have you a TUBE PROBLEM?

— *if so, let us solve it*

As a user of tubes — metal or otherwise — just consider whether or not a PAPER tube will do the job. Our paper tubes, **made of special quality paper, are impregnated with Thermo-hardening resins.** Strong, light in weight, they show a definite economy in cost. Used increasingly with every satisfaction in many industries. It will pay you to investigate this. Write to:

THE TEXTILE PAPER TUBE CO. LTD.
OAKWOOD MILLS · ROMILEY · NR. STOCKPORT
Telephone: Woodley 2271-4

THE 'MAGIC' OF
'METALLIZED' PLASTICS



We extend to all our friends at home and overseas
"Best Wishes for Christmas and the New Year"

Vacuum 'METALLIZING' now makes available for decoration, fabrication, display and packaging the eye-appeal of sparkling metallic surfaces for all types of plastic mouldings. The simplicity and economics of this rapidly growing technique, which is putting colour, vivacity and realism into plastic articles, has given the industry a powerful new sales force.

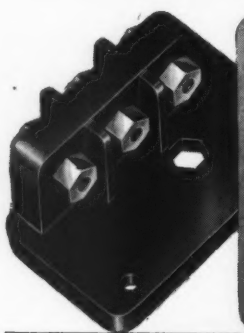
For better vacuum service . . .
EDWARDS HIGH VACUUM LTD
MANOR ROYAL · CRAWLEY · SUSSEX CRAWLEY 1500 (10 LINES) EDCOHIVAC CRAWLEY

Wanted STOCKS for CASH

We are cash buyers of merchandise of every description. Also Clearance Stocks, Discontinued Lines, Surplus and Redundant Stocks. **BOTTLES, Jars, Screw Caps, Cartons,** and other **Packaging Materials.** In fact, goods of all kinds can be disposed of through us without delay, on the most favourable terms, and without trouble.

Should you have anything for disposal either now or at any future time please send us samples, full particulars and price on a cash settlement basis and the matter will have our immediate and careful attention.

RELIANCE TRADING CO.
13, NEW COLLEGE PARADE, FINCHLEY RD., LONDON, N.W.3
Phone: PRIMROSE 5611 & 3167 *Grams:* "GORDON" PRIMROSE 5611



Quality PLASTIC MOULDINGS with Service

Consult **SOUPLEX Limited**
WESTGATE · MORECAMBE · 'Phone 1717/8/9

The Reliable Source for
Buying and Selling all types of Plastic Scrap - Powders and "Spot" lots.

PLASTIC SCRAP

We welcome enquiries to grind customers' own material.

Acetate
Butyrate
Nylon
Polyethylene

J. W. NASH & CO., LTD.
27, BEETHOVEN STREET, LONDON, W.10
LADBROKE 4655-6-7

Acrylics
Celluloid
Polystyrene
P.V.C.

MILTOID SALES

DEPARTMENT

BX PLASTICS LTD

A Subsidiary of the British Xylonite Co. Ltd.

for

Celluloid
In sheets, clear transparent, white and black in standard size of 54" x 24" and in various thicknesses.

Bexoid Cellulose Acetate (REGD.)
In sheets, clear transparent, white and black in standard size of 54" x 24" and in various thicknesses.

Bexoid Optical Sheet
also special Transparent Range of 44 attractive colours (10/1000" thickness only)

Bexoid Film
In clear transparent only

BX Polystyrene
in sheets and rods

Cobex (REGD.) Rigid Vinyl Sheet

Velbex (REGD.)
In clear transparent and industrial black sheet. Velbex P.V.C. Transparent Beer Hose and Industrial Hose.

Lampshade sheet
in Bexoid and Cobex

34-36 Royal College Street · London · N.W.1

Phone : EUSton 4146/7 · Grams : Celudol, Norwest, London

TA8314

Makers of Better Plastics rely on

VICTOR BLAGDEN CHEMICALS

for the Plastics Industry

PHENOL 39/41°

META CRESOL

Manufactured by
P. R. CHEMICALS LTD., Silvertown

FORMALDEHYDE

Manufactured by
The B.N.R. COMPANY, Barking

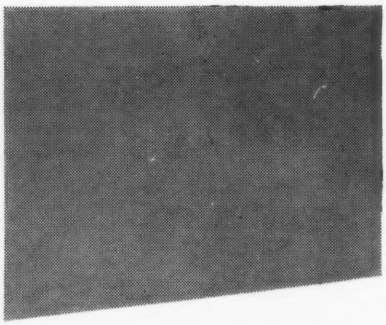
Enquiries to the Sole Selling Agents:—

VICTOR BLAGDEN & CO. LTD.

PLANTATION HOUSE, MINCING LANE, LONDON, E.C.3

Telephone: MANsion House 2861 (6 lines)
Telegrams: BLAGDENITE FEN, LONDON

Norwich Union Building, City Square, Leeds. Telephone: 28236



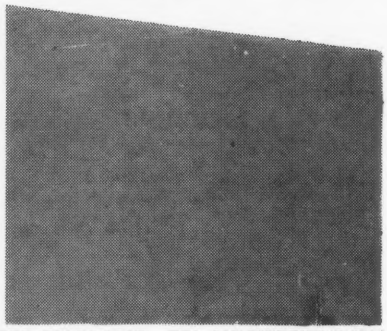
LEAD 2-ETHYL HEXOATE

LEAD SALICYLATE

LEAD STEARATE

P.V.C.
STABILISER/PLASTICISER
DISPERSIONS

ST JUST



THEODORE ST. JUST & COMPANY LTD. WHITEFIELD, MANCHESTER, ENGLAND · TEL: WHITEFIELD 3211

PLASTIC COMPOUNDS and SHEETINGS

PUNCH and PRESS BOARDS

Phenco Flooring in Tiles and Sheet

CONVERSION, COMPOUNDING and CALENDERING of CUSTOMERS' PLASTIC SCRAP

Phoenix Rubber Company Limited

91 Bishopsgate, London, E.C.2 *London Wall 1622*

Works: **2K Buckingham Avenue, Slough Trading Estate, Slough, Bucks.** *Slough 22307/8/9*

M. CALDERON LTD.
SPECIALISTS IN
THE MANUFACTURE OF
HEATING ELEMENTS
FOR THE
PLASTICS MOULDING INDUSTRY
ALL ENQUIRIES TO HEAD OFFICE
SEBASTIAN HOUSE,
SEBASTIAN STREET, LONDON, E.C.1
CLE 1712/3

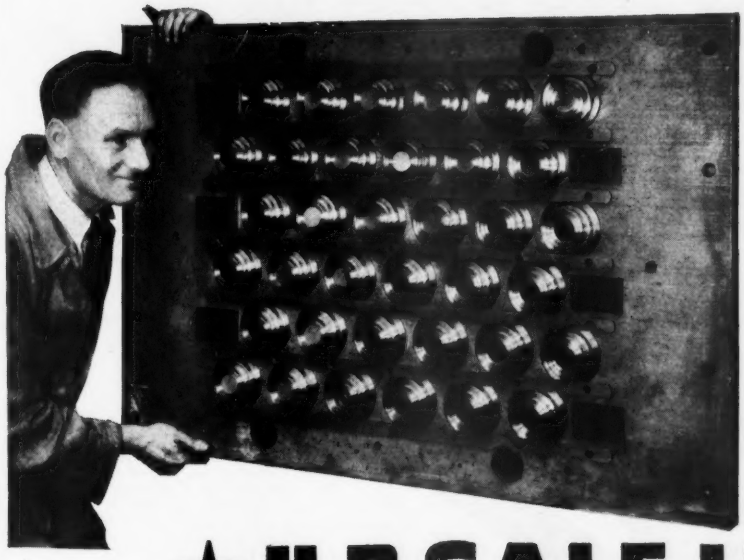
TRADE EMPIRITE MARK

Empire Plastics (Birmingham) Ltd

EMPIRE WORKS
BRUETON STREET
BIRMINGHAM · 4
Phone: ASTon Cross 2451

PLASTIC MOULDINGS FOR THE TRADE

Moulds by Experts.



TOP PORTION OF 36 IMP. STRIPPER PLATE MOULD FOR 2¼" CAP CLOSURE WITH STANDARD JAR THREAD.

MOULDINGS ARE SPRUNG OFF THREADED PUNCH.

★ H.B.SALE LTD.

PROGRESS WORKS, SUMMER LANE, BIRMINGHAM, 19

Established 1863 TEL.: CEN. 5661/3 GRAMS.: SALE, B'HAM Member of G.T.M.A

BAND & CARTRIDGE HEATERS

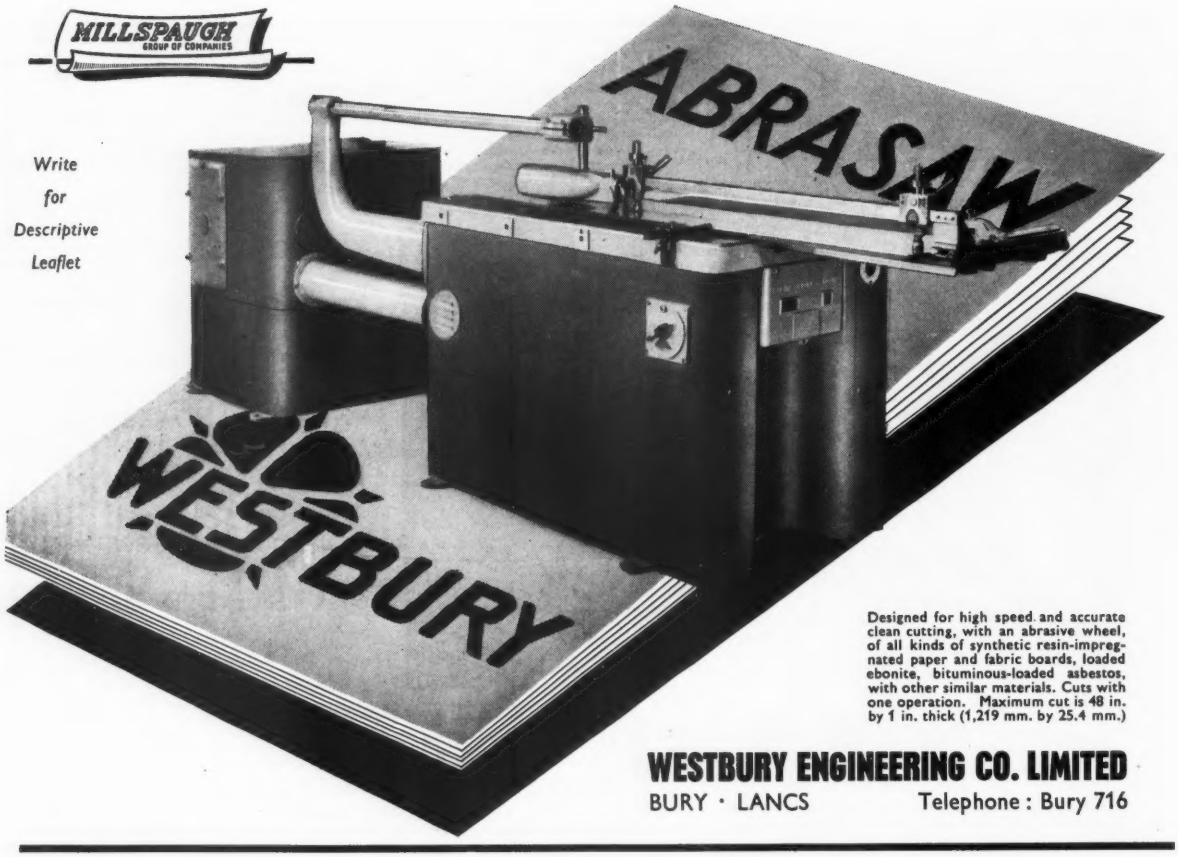
for the
PLASTICS INDUSTRY

MICA-WOUND BAND HEATERS MADE FROM BEST QUALITY MATERIALS. SUITABLE FOR EXTRUDERS, DIES, BARRELS AND MOULDING PRESSES. LAGGING CASES ASBESTOS MATTRESS FILLED. OUR ENGINEERS WILL DISCUSS YOUR PROBLEMS ON SITE.

PHONE 52148 **GENRISTO** *LTD.* OSMASTON ST. NOTTINGHAM

MILLSPAUGH
GROUP OF COMPANIES

Write for Descriptive Leaflet



Designed for high speed and accurate clean cutting, with an abrasive wheel, of all kinds of synthetic resin-impregnated paper and fabric boards, loaded ebonite, bituminous-loaded asbestos, with other similar materials. Cuts with one operation. Maximum cut is 48 in. by 1 in. thick (1,219 mm. by 25.4 mm.)

WESTBURY ENGINEERING CO. LIMITED
BURY · LANCS Telephone : Bury 716

PIONEERS
IN
MOULDS
FOR MODERN PLASTICS
also
PRESS TOOLS, JIGS & GAUGES

BARBER & DUFFY LTD
214/222 CARDIGAN RD., LEEDS
Phone: Leeds 52033

PLASTICS

POLYTHENE, Polystyrene, Acetate and Perspex. We are sellers and buyers of these materials in any form.
GRANULATION and reprocessing plant available for:— Nylon, Cellulose Acetate, Polystyrene, Polythene and other Thermoplastic scrap. Materials ground to customers' requirements.
All enquiries to:—

John Castle & Co. Ltd.
5 HURLEY RD., LONDON, S.E.11
Phone: RELiance 4274/5

TUFFLEX

EXTRUSIONS
are our business . . .
Not just a department

AS the leading specialists in this field our technical staff welcome enquiries for all types of extruded plastics. We can promise you also keen personal service and a completely satisfactory product.

C&C MARSHALL LTD
PLASTRIP HOUSE, OAKLEIGH ROAD NORTH, LONDON, N.20
Telephone : Hillside 5041 (3 lines). Telegrams : Tufflex, Norfinch, London
Cables : Tufflex, London

UCC

CHEMICALS FROM COAL

COUMARONE RESINS

Enquiries to:-

UNITED COKE & CHEMICALS COMPANY LTD.

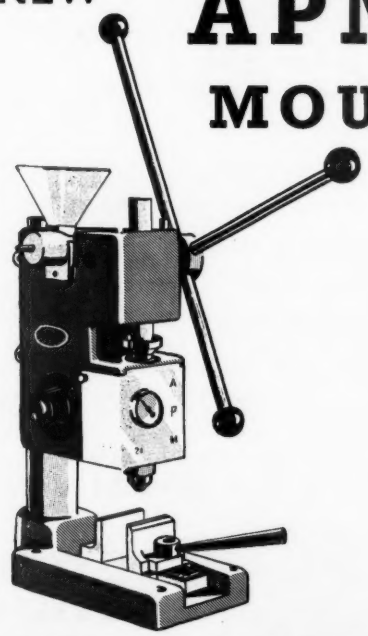
(SALES DEPARTMENT 75) 34, Collegiate Crescent, Sheffield, 10

Telephone: Sheffield 63025 Telegrams: 'Unichem' Sheffield

THE UNITED STEEL COMPANIES LTD

UCC.5

NEW **APM 21** HAND OPERATED BENCH INJECTION **MOULDING MACHINE**



★ SUITABLE FOR WORKING THERMOPLASTICS—CELLULOSE ACETATE, POLYSTYRENE, POLYTHENE, P V C, etc. with normal cylinder—NYLON with special cylinder.

★ FITTED WITH SEMI-AUTOMATIC HOPPER FEED.

★ CAPABLE OF PRODUCTION RATES, depending upon mould design UP TO 100 INJECTIONS PER HOUR WITHOUT SPECIAL SKILL.

AND TWO TOTALLY NEW FEATURES!

★ FITTED WITH NEW LEAK-PROOF, SELF-SEALING AND INTERCHANGEABLE CYLINDER UNIT (Patented).

★ CAPABLE OF ACCOMMODATING MOULDS OF VARYING SIZES IN NEW QUICK-ACTING CAM-LOCK VICE.

ASMIDAR PLASTIC MOULDING MACHINES LTD.

5 RAMPAYNE STREET, LONDON, S.W.1 Telephone: VICtoria 5555 (3 lines)

CARBAZOLE

A PLASTIC POTENTIAL
HIGHEST COMMERCIAL QUALITY

For Samples and Quotations

Apply to
Sales Dept: **L. B. HOLLIDAY & Co LTD HUDDERSFIELD**

PLASTICS FOR INDUSTRY?

RMP

HAVE the experience AND the equipment

Compression and Injection Mouldings
Sawn and Machined Parts
PERSPEX and P.V.C. Mouldings
Laminated Tubes, Angles and Channels

RESINOID & MICA PRODUCTS LTD
MARY ST · BIRMINGHAM 12 · Tel Calthorpe 1303
LONDON 28 Queen Anne's Gate S.W.1 Tel WHitehall 8892
One of the group of companies associated with the Southern Areas Electric Corporation Limited

BYSON FOR BAKELITE

Acetate and other Synthetic Mouldings, Modern Plant and Facilities.

APPLIANCE CO. LTD.,
WOOLFOLD, BURY, LANCS.
Telephone : Bury 1560-1 Telegrams : "Bysonite, Bury."

Moulds for Plastics

By W. M. Halliday **259 pp.** **Price 30/-** (*by post 30s. 6d.*)

An aid to toolmakers in the plastics and pressure diecasting industries dealing with mould design, construction and maintenance.

"An important and comprehensive handbook for plastic-mould engineers and to all those connected with manufacturing plastics products."—MODERN PLASTICS

TEMPLE PRESS LIMITED
BOWLING GREEN LANE, LONDON, E.C.1

Are You Buying HOME AND EXPORT

B.L.C.
(EXPORTS) LIMITED

92 BAYLIS ROAD
LONDON S.E.1

TELEGRAMS / PHONE BALACA WATerloo 3616-7

the **RIGHT** *Quality at the* **RIGHT** *Price?*

for **ALL THERMOPLASTICS**

CELLULOSE ACETATE · BUTYRATE
POLYSTYRENE · P.V.C., etc., etc.

Right off the beaten track

Take one towpath. Lay rails on a foundation of ashes. Next, place one steam travelling crane on track. If you now begin loading and unloading, the chances are your crane will end up end-up. (See illustration).

What Vulcan say about it

Poor track formation is too often the cause of accidents to travelling cranes. Once again, prevention of disaster means scrupulous inspection and maintenance of all temporary rail tracks. Once again, Vulcan are the experts to turn to.

Engineer-Surveyors from Vulcan Insurance spot the danger before the trouble starts, and industrial machinery is their happy hunting ground. Cranes, lifts, hoists, boilers, vacuum vessels — any and every plant comes under their eagle-eyed scrutiny, and gets the specialist going-over for which Vulcan is renowned. In a sentence, safety first is Vulcan first.

VULCAN INSPECTS—AND PROTECTS

THE **Vulcan**

BOILER & GENERAL INSURANCE CO. LTD.

67 King Street, Manchester 2

FREE. For news of industrial accidents and ways to avoid them, ask us now for 'Vulcan', a quarterly journal for Power users. Please write to Dept. 11.

The JUNIOR ROTARY CUTTER

This is the ideal Rotary Cutter designed to meet all demands, for a really robust yet small machine with a high performance.

The Junior is a product of specialists in Rotary Cutter design over many years, and is an addition to the range of well-known Masson Rotary Cutters.

The Junior Rotary Cutter is a self-contained unit with built-in granule collecting drawer, and is driven by a 1 h.p. motor mounted on framework.

The machine is quiet in operation and has been designed to ensure easy cleaning and maintenance. If desired the unit can be supplied suitable for bench or mobile mounting.

Please write for further details

BLACKFRIARS ROTARY CUTTERS LTD

BLACKFRIARS HOUSE NEW BRIDGE STREET

LONDON·E·C·4

TELEPHONE: CENTRAL 6383-4

TELEGRAMS: PAPMILENG LUD LONDON

BUYERS
MICHAEL S. STEVENS LTD

Do not let your Scrap Plastics pile up and use up valuable storage space—convert it into money by ringing Michael S. Stevens Ltd. who specialize in Works Collection of Injection Scrap, Scrap cuttings, etc.

MICHAEL S. STEVENS LTD.
Keswick Rd., London, SW15

VANDYKE 3345-6

DIXONS OF HALIFAX

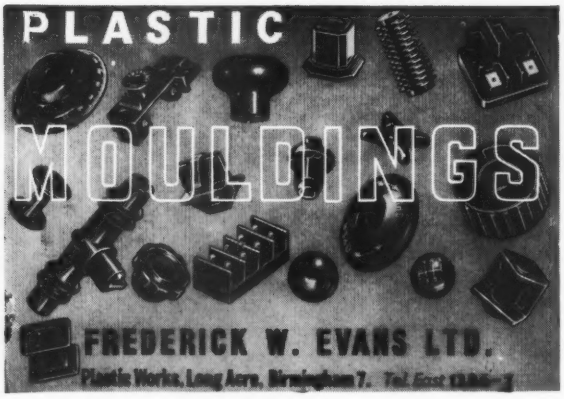
★ **Wire Shapes**
FOR THE PLASTICS TRADE

ARTHUR DIXON & CO. LTD.
RAGLAN ST., HALIFAX, YORKS
Halifax 3339 & 5249
103 GEORGE STREET, CROYDON
SURREY Croydon 3814

ISLINGTON PLASTICS LIMITED
Injection Moulders
CAPACITY UP TO **4** OZ.

SPECIALISTS TO THE TRADE

287 Liverpool Road, N.1
Telephone: North 4310



REQUIRED
IN LONDON AREA OR WITHIN 10 MILES
SINGLE-STOREY
FACTORY
SUITABLE FOR PRINTING WORKS

20,000 TO 40,000 SQUARE FEET
WITH GOOD NATURAL LIGHT

CHAMBERLAIN & WILLOWS
23 MOORGATE LONDON E.C.2
METROPOLITAN 8001

LY-BAK LIMITED RUBBER & PLASTICS MANUFACTURERS

THERMOPLASTICS
Cellulose Acetate · Polythene · Polystyrene
Aceto-Butyrate · P.V.C. and Co-polymer
Polystyrene/rubber compound

SOUTHERN INDUSTRIES AGENCY
(LONDON SALES OFFICE FOR THE GROUP)
FARADAY HOUSE, 8-10, CHARING CROSS ROAD, LONDON, W.C.2. **Telephone: Covent Garden 2538**

Virgin high acetyl and standard, cellulose acetate moulding powders. We are able to reprocess your redundant stocks and scrap into first class moulding powders. We would be pleased to make you an offer for your scrap. Prompt deliveries of virgin and reconstituted powders.

LET US SOLVE YOUR MATERIAL PROBLEMS—THERMOPLASTICS IS OUR BUSINESS
"LY-BAK PRODUCTS STAND UP TO THE JOB"

Classified Advertisements

PRESS DAY.—Classified advertisements for the January issue must be received at Head Office by first post Friday, December 30. Last-minute additions and deletions are accepted by telephone from trade advertisers up to noon. Advertisements received too late for a particular issue are automatically inserted in the succeeding one unless instructions to the contrary are received.

RATES.—4d. per word (minimum 12 words 4/-). Each paragraph charged separately and name and address must be paid for. Semi-displayed setting 35/- per single column inch. Series discounts of 5% for 6, and 10% for 12 consecutive insertions allowed to trade advertisers.

TERMS.—Strictly net and prepayable. Monthly accounts for settlement by the end of the month following insertion are allowed to trade advertisers if satisfactory references are provided.

REMITTANCES.—Cheques and postal orders should be crossed and made payable to TEMPLE PRESS LIMITED and instructions sent addressed to the Manager, "Plastics," Bowling Green Lane, London, E.C.1.

THE PROPRIETORS retain the right to refuse or withdraw advertisements at their discretion and are not responsible for clerical or printers' errors although every care is taken to avoid mistakes.

BOX NUMBERS.—Private advertisers desiring to have replies sent care of "Plastics" may do so on payment of 1/- to cover booking and postage, plus cost of four extra words. To avoid mistakes in forwarding, Box numbers should be carefully and legibly copied and replies sent to Box P000, care of "Plastics," Bowling Green Lane, London, E.C.1.

DEPOSIT SYSTEM.—Facilities are available to readers to purchase advertised goods on approval by depositing the purchase price with "Plastics." Full details on application. Commission 1% (minimum 2/-) on amount deposited.

HEAD OFFICES: Bowling Green Lane, London, E.C.1, England. Telephone: Terminus 3636. Telegrams: "Pressimus, Paone, London."

BRANCH OFFICES: 7, John Bright Street, Birmingham, 1. Telephone: Midland 4117-8. 50, Hertford Street, Coventry. Telephone: Coventry 62464. 1, Brazennose Street, Manchester. Telephone: Deansgate 6114-8. 12, Renfield Street, Glasgow. Telephone: Glasgow Central 1413.

AGENCIES—WANTED

EXPORT MERCHANTS with associated companies in Middle and Far East, South America, Commonwealth and Europe, seek agencies from first-class manufacturers of plastic sheets, rods, etc., all types, desirous of developing export trade. Write Box P2122, care of "Plastics." 221-38

IMPORTANT FRENCH INDUSTRIAL COMPANY IN PARIS, established in 1920, first-class references, with an excellent commercial organization, wishes to add to its industrial activities an exclusive agency in France for the sale of high-class products, rubber, plastics, industrial adhesives, footwear manufacturers' supplies.

Write: Contesse and Cie., 8 Square de la Dordogne, Paris, 17eme, No. E, who will transmit. 221-7

AUCTIONS

ESTABLISHED 1855.

EDWARD RUSHTON, SON AND KENYON,

INDUSTRIAL VALUERS, AUCTIONEERS AND

FIRE LOSS ASSESSORS,

12 YORK STREET,

MANCHESTER, 2.

Phone, Central 1937-8.

Grams, Russonken, Manchester. zzz-304

BUSINESS OPPORTUNITIES

PROGRESSIVE COMPANY marketing plastic goods in the United Kingdom with excellent established distribution, offers service to manufacturers as sole distributors. All offers to Aero Marketing, Ltd., 9 Warwick Court, W.C.1. 223-1157

VACUUM FORMING CAPACITY AVAILABLE, together with full facilities for fabricating, engraving and printing of all plastic materials. Omega Plastics, Ltd., Highbridge Rd., Town Quay, Barking, Essex. 223-1158

WANTED TO PURCHASE.

THE MARLEY TILE COMPANY, LIMITED,

IS INTERESTED IN PURCHASING

A BUSINESS WITH GOOD MANUFACTURING

FACILITIES OF PLASTICS PRODUCTS.

MUST HAVE POSSIBILITIES FOR EXPANSION.

COMMUNICATE IN CONFIDENCE TO:—

THE MANAGING DIRECTOR,

THE MARLEY TILE COMPANY, LIMITED,

RIVERHEAD,

SEVENOAKS, KENT.

221-1177

MOULDING CONCERN with very large toolmaking programme seeks reputable firm of toolmakers with view to permanent tie-up. Very attractive financial proposition. Principals only please write. Box P2112, care of "Plastics." 221-31

Business Opportunities (contd.)

COMPANY (NON-FERROUS) with factories undergoing plant re-organization in North of England interested in warehousing, stocking and/or selling any suitable lines. Very extensive selling organization to plumbing trade, including merchants, gas industry, engineering and chemical industries. Transport fleet covers all North and Midlands. Replies to General Sales Manager—Confidential. Box P2023, care of "Plastics." 221-1179

COMPANY OF REPUTE with a large sales force calling wholesale and retail outlets wishes to extend its activities into household plastics. Inquiries invited from plastic moulders who must have immediate capacity for large scale production of an initial range of six items.

The advertisers would supply working drawings and/or full-scale models and would pay for and own their own moulds. In addition the company would be interested in buying part or complete output of existing unbranded household items. Purchase of a company would also be considered. Write to Box No. 9388, care of Charles Barker and Sons, Ltd., 31 Budge Row, London, E.C.4. 221-33

WE OPERATE the most efficient and extensive distribution service for plastic products in Great Britain, with or without manufacturing facilities. Designers with ideas for exploitation and moulders, etc., having products, particularly those of interest to the hardware trade, requiring nation-wide distribution, should write in confidence to the Managing Director, Box P1327, care of "Plastics." 221-14

MACHINERY, TOOLS AND PLANT

ALTERATIONS. Diesel sets, electric motors, switch gear, transmission equipment, fluorescent lighting and industrial fittings ex stock, keen prices. Contact G. L. Murphy, Ltd., Manston, near Leeds. zzz-489

HYDRAULIC PRESSES.

1,000-ton downstroke and horizontal angle press by Leeds Eng., 18-in. glanded downstroke ram, 8½-in. stroke, clamping surface 15 in. by 22 in. max. daylight 25½ in. Two pull back rams 3½ in. dia. Three throw hydr. pump available.

Three 635-ton upstroke presses by John Shaw, ram 18-in. dia. and four steel columns, distances between 72½ in. by 20 in. Moving table working area 6 ft. by 4 ft. Daylight 6 ft. adjustable WP. 2½ t. sq. in.

500-ton downstroke press by Greenwood and Batley, 18-in. dia. ram by 28-in. stroke. Four columns 6-in. dia. 22 in. by 17¾ in. between. Fully guided table, working area 31 in. by 22 in. Daylight 42 in. WP. 2 t. sq. in.

400-ton Fielding and Platt downstroke concrete slab and kerb press. Prefilling ram 23-in. dia., with 4-in. pullback. Two columns 8-in. dia. by 56-in. between. WP. 1 t. sq. in.

400-ton upstroke press by Greenwood and Batley Ram 16-in. dia. by 28-in. stroke, WP. 2 tons sq. in. Four columns 5-in. dia. distance between 22 in. by 17½ in. With nine steam-heated platens 36 in. by 17 in. giving eight daylights 2⅞ in.

260-ton upstroke press. Ram 15-in. dia. by 4-ft. stroke. Four steel columns 5¼-in. dia., distances between 72¼ in. by 20½. Moving table working area 6 ft. by 4 ft. Daylight 6 ft. adjustable. WP. 1½ t. sq. in.

225-ton upstroke press Ram 12-in. dia. by 42-in. stroke. Four columns 4⅝-in. dia., distances between 71½ in. by 21½ in. Moving table working area 71 in. by 50 in. Daylight 6 ft. adjustable. WP. 2 t. sq. in.

GEORGE COHEN SONS AND CO, LTD.,
WOOD LANE, LONDON, W.12.
Phone, Shepherd's Bush 2070.
AND
STANNINGLEY, NR. LEEDS.
Phone, Pudsey 2241. 227-27

Machinery, Tools and Plant (contd.)

HYDRAULIC. Frazer mono-radial pumps, new and second-hand in stock. Thompson and Son (Millwall), Ltd., Cuba St., London, E.14. East 1844. zzz-302

INJECTION MOULDING MACHINES. Windsor S.H.2 for sale (two), list price £1,250 each, will accept best offer near £850 each; nearly new. Selsdon Plastics Co., Ltd., 14 Weedington Rd., Kentish Town, London, N.W.5. 221-32

FOR SALE. 250-ton Daniels down-stroking press with electric plattens, may be viewed working in London. Box P2110, care of "Plastics." 221-30

BAND SAW. Tyler 15-in. motorized, cut any shape metal or plastic. B.D.C., Ltd., Edward Rd., New Barnet, Herts. Barnet 9211. 221-2

THE CORRY PLATFORM TRUCK is the lowest-priced truck available at the present time with a 1-ton load capacity. Fitted with roller bearing wheels and rubber tyres. Details from J. L. Allen and Co., Chedington, Beaminster, Dorset. 222-x9893

PLASTICS MACHINERY

Hydraulic Presses of all sizes. Injection Machines. Extruders. Mixing Mills. Hydraulic Pumps and Accumulators.

Send your requirements to the specialists.

REED BROTHERS (ENGINEERING), LTD.,
REPLANT WORKS,
CUBA STREET, MILLWALL, E.14.
Phone, East 4081 (five lines). 221-34

400-TON UPSTROKE HYDRAULIC by Rose, Downs and Thompson, ram 16-in. dia. by 14-in. stroke, with electric platens, 27 in. by 17 in.

Towler electraulic pump complete with oil tank and built in 15 h.p. motor, capable of running above press with additional capacity.

100-140-ton downstroke hydraulic by Daniels, ram 12-in. dia. by 16-in. stroke, fitted timer unit and ejector gear, with 20-in. by 20-in. electric platens complete with built in Towler pump and motor.

100-ton downstroke hydraulic by Bradley and Turton, ram 12-in. dia. by 11-in. stroke, with electric platens 20 in. by 20 in.

Two 100-ton upstroke hydraulics by Fowler and McCollin, ram 12-in. dia. by 10-in. stroke, with electric platens 19 in. by 13 in.

Bradley and Turton 4-throw pump with built in 4 h.p. motor, capable of running three 100-ton presses.

50-ton upstroke hydraulic by Bradley and Turton, ram 8-in. dia. by 10-in. stroke with electric platens 15 in. by 15 in.

10-12-ton and 15-20-ton hand toggle presses with slotted tables.

Daniels pre-former No. 3 capacity up to 2¾ in. by 1¼ in. pellet, complete with built in 10 h.p. motor.

Manesty (F type) tablet machine, capacity up to ¾-in. dia. pellet, complete with motor.

Radyne pre-heater, capacity up to 2-3 lb., 12 oz. per minute.

Compression moulding tools, bench drills, grinders, linishers, saws and miscellaneous machinery, Perspex, P.V.C. and plastic sheeting.

Further particulars and prices from: Northern Plastics, Ltd., Chiswick Grove, Blackpool. Phone, Marton 940. 221-x1064

MACHINERY, TOOLS AND PLANT WANTED

T.M.A. INJECTION-MOULDING MACHINES required, 2-, 3-, 4-oz., mainly interested in 4-oz. machines of recent design and good condition essential. Details to Box P194, care of "Plastics." 221-1166

ONE JACKETED BALL MILL required, approx. 4 ft. diameter by 4 ft. long, preferably complete with motor and drive, suitable for electrical supply of 400/440 v., 3 phase, 50 cycles. Box P2116, care of "Plastics." 221-4

Machinery, Tools and Plant Wanted (contd.)

WANTED. Peco 2-oz. injection moulding machine. Box P2115, care of " Plastics." 221-5

WANTED. 1-oz. and 2-oz. Hupfield injection moulding machines. State age, condition and price required. Box P216, care of " Plastics." 221-18

WANTED. One Francis Shaw injection moulding machine. Particulars and price to R.H.C. Reclamations, Ltd., Batford Mill, Lower Luton Rd., Harpenden, Herts. 221-29

MISCELLANEOUS

EXTEND YOUR TRADE.
Use a trade mark. Consult
Trade Mark Protection Society,
12 Church St., Liverpool. zzz-294

MOULDS

COMPRESSION MOULDS FOR SALE. Consist of household articles, fancy goods; smokers' sundries, toys and games, etc. Would make a very good range in particular for an overseas moulder. Write for full details. Box P186, care of " Plastics." 223-1161

PRODUCTION CAPACITY

INJECTION MOULDINGS AND PLASTIC
COVERING IN ACETATE ALKATHENE, P.V.C.,
POLYSTYRENE AND DIAKON.
Machined Parts in Brass, Steel and Plastics.
We solicit your inquiries.
F. A. KETCH AND SON, LTD.,
TRENT VALLEY WORKS,
LICHFIELD, STAFFS.
Phone 3591 and 3592. zzz-500

P.V.C. SLUSH MOULDING AND DIPPING. D. R. Cheshire, Ltd., 43 Newington Causeway, S.E.1. Phone, Hop 1816. zzz-296

SMALL FACTORY, equipped with hand-injection machines, fly and power presses, etc., capacity available or suggestions for use invited. London area. Box P1811, care of " Plastics." zzz-301

VISIJAR LABORATORIES, LTD.,
THE LEADING CRAFTSMEN IN
" PERSPEX."
PROTOTYPE AND REPETITION.
OFFICIAL I.C.I. STOCKISTS " PERSPEX "
SHEET, TUBE, ROD.
STOCKISTS AND FABRICATORS OF " FORMICA."
149 LONDON ROAD, CROYDON, SURREY.
Phone, Croydon 8228 (two lines). zzz-492

CAPACITY AVAILABLE for manufacturing compression and injection moulds, together with jigs and general engineering to customers' own designs, or alternatively, designed by us. Inquiries for same will receive prompt attention. Elloid Engineering Co., Ltd., Goodacre St., Mansfield, Notts. Phone, Mansfield 2614. zzz-299

PLASTICS (MANCHESTER), LTD.,
BRITAIN'S LEADING STOCKISTS AND DISTRIBUTORS.
SPECIALISTS IN
FABRICATION, INJECTION MOULDING AND ENGRAVING.
11 WHITWORTH STREET,
MANCHESTER, 1.
Central 7081-2 and Central 1000. zzz-493

REPETITION in Ebonite, Erinoid, etc. Capstan lathe work. Temple St., Rugby. Phone 4059. 223-1118

DINES PRODUCTS, Whitehall Lane, Grays, Essex, for injection mouldings. 223-1120

CASTINGS, negligible tool costs.
Phenolic resin castings (plated or coloured), maximum size 6 in. by 4 in. by 1 in.
Quick delivery, any quantity, inquiries invited.
Bashford Hill and Co., Ltd. Works behind 44 Gloucester Rd., Croydon. Phone, Tho 3428. 224-1174

ELCO PLASTICS, LTD.,
HIGH WYCOMBE,
BUCKS.
A.I.D. APPROVED.
MOULDERS, INJECTION COMPRESSION,
TRANSFER, SIDE RAM.
HIGH WYCOMBE 1921-2. zzz-498

Production Capacity (contd.)

SHORT RUNS A SPECIALITY, LONG RUNS A PLEASURE. Low mould cost and overheads. Injection capacity and technical knowledge at your service. Westminster Plastics, Temple Works, 41 Old Church Rd., Chingford, E.4. Silverthorn 7927. 223-1121

KINGSTON PLASTICS, LTD., Unity Works, Union St., Kingston-on-Thames. Manufacturers of virgin and second-grade cellulose acetate moulding powders, matched to customer's own requirements for colour and flow. Customer's own waste also reprocessed to specified requirements. Sorting and grinding, incorporating magnetic separation of metallic particles of all thermoplastics undertaken. Phone, Kingston 8405. 225-1174

POLYSTYRENE AND CELLULOSE ACETATE INJECTION MOULDINGS up to 2 oz. Reliable service. Latest-type machines. Keen co-operation on new lines. W. H. Adamson Plastics, Ltd., 39 Hedley St., Maidstone. 225-1175

GREENWOOD RAWLINS AND CO., LTD., Brook Rd., Rayleigh, Essex (phone, Rayleigh 903). Compression and injection moulders. Own tool-room. Specialists in high-grade electrical mouldings. Subcontracts welcomed. 222-1176

TUBE LAMINATION AND ENGINEERING, LTD.,
HIGH WYCOMBE,
BUCKS.
MAKERS OF S.R.B.P. TUBE " LAMTUF."
LIGHT ENGINEERS.
HIGH WYCOMBE 1921-2. zzz-499

INJECTION MOULDINGS IN THERMOPLASTICS. Moulding in styrene, acrylics and acetate. Design and tool room facilities available for mould construction. Inquiries invited. J. and E. Courtenay, Ltd., 138 Stratford Rd., Birmingham, 11. 226-1184

CHIPPING OF PLASTICS AND GRINDING, screening, mixing and drying of all raw materials undertaken for the trade. Crack Pulverizing Mills, Ltd., Plantation House, London, E.C.3. Man 4405. zzz-0302

INJECTION MOULDINGS by I.O.G. Industries, Ltd., 41 Marshgate Lane, Stratford, E.15. Maryland 2804. 232-1182

INJECTION MOULDING CAPACITY
AVAILABLE ON
WINDSOR 2 OZ.
AND
EDGWICK 1½ OZ.
MACHINES.
Expert supervision and labour.
Very competitive quotations.
SELSDON PLASTICS, LTD.,
14-18 WEEDINGTON ROAD,
KENTISH TOWN,
LONDON, N.W.5. 221-1

HIGH FREQUENCY WELDING of P.V.C., etc. Experts in design and fabrication. Ace Manufacturing Co. 1 Palmerston Road, E.17. Larkswood 5157. 221-42

PRODUCTION CAPACITY WANTED

PROGRESSIVE MANUFACTURERS seek further injection moulding capacity up to 8 oz., continuous work throughout the year, essential for assembly to be undertaken. Full details to Box P193, care of " Plastics." 221-1165

RAW MATERIAL

ALWAYS LARGE STOCKS OF
CASEIN
RODS, TUBES AND SHEETS.
PERSPEX
SHEETS UP TO 1 IN. THICK.
CELLULOSE ACETATE
CATALIN RODS.
S.R. (PLASTICS), LTD.,
93 ALDERSGATE STREET, E.C.1.
Phone, Monarch 4686. 221-1103

PERSPEX, Formica, Warerite, Traffolyte Eng., sheet. Specialists in cut sizes. Immediate delivery.
F. J. Bly and Co., Ltd., Empire Arcade, 370 Upper St., Angel, N.1. Can 5242-3. zzz-300

BLACK VIRGIN POLYSTYRENE, large quantity, at 1s. 9d. per lb. for sale. Write for particulars. Box P2114, care of " Plastics." 221-13

POLYSTYRENE AND ACETATE SCRAP for disposal. Please inquire Box P129, care of " Plastics." 221-9

Raw Material (contd.)

PERSPEX! PERSPEX!! PERSPEX!!! Official stockists for I.C.I. acrylic sheets. Sheets cut to your requirements. Fabrication and mounting specialists to the trade:—
S. C. Errington (Hanwell), Ltd., 132a Uxbridge Rd., Hanwell, London, W.7. Phone, Ealing 5288. zzz-040

NYLON SCRAP, reground, good colours, about 2 tons for sale. Box P2111, care of " Plastics." 221-10

PLASTICS (MANCHESTER), LIMITED,
BRITAIN'S LEADING STOCKISTS
OF
PERSPEX SHEET, ROD, TUBE.
11 WHITWORTH STREET,
MANCHESTER, 1.
Central 7081-2 and 1000. zzz-494

BUTYRATE (TENITE 11) VIRGIN, about 7½ tons for sale. Box 2126, care of " Plastics." 221-44

NYLON LUMPS and reground for sale. Box 2127, care of " Plastics." 221-45

CUEX, LTD., can offer all at prices well below current list:—
Polystyrene.
Cellulose acetate.
Polyethylene.
P.V.C.
Polyvinyl butyral.
Perspex and Diakon.
Send now for details.
Cuex, Ltd., 270 Corporation St., Birmingham. Central 5474. 221-43

AVAILABLE 20 tons black polythene granules. Reasonable offer accepted. Box P1935, care of " Plastics." 221-16

LARGE QUANTITY of printed polythene film available. Please contact, Box P1936, care of " Plastics." 221-15

125 SHEETS of 60/1000-IN. CINEMOID, red, yellow and green available. 50 sheets of ⅛-in. red Isoflex. Box P2113, care of " Plastics." 221-6

RAW MATERIAL WANTED

CELLULOID AND ACETATE CLEAR AND WHITE UNIFORM OFFCUTS 10 and 15 thou. required. Normograph, 70 Princedale Rd., W.11. 221-1163

WANTED, Polythene scrap. Write to Box P7416, care of " Plastics." zzz-0322

P.V.C. GARMENT AND HANDBAG OFFCUTS wanted. We collect and pay cash. Brockwell Plastics, Ltd., 50 Hollingbourne Rd., S.E.24. zzz-490

PROMPT CASH OFFERED for virgin and reprocessed cellulose acetate and polystyrene. Give manufacturers name and backing. Box P873, care of " Plastics." zzz-491

WE ARE INTERESTED in buying polystyrene scrap and virgin materials for cash. Box P1127, care of " Plastics." 223-1108

SURPLUS STOCKS of thermosetting and thermoplastic moulding powders wanted. Send details. Box P1727, care of " Plastics." zzz-297

ERLANOS LTD., 93 Aldersgate St., E.C. (Monarch 4686), require Perspex and cellulose offcuts and scrap, clear and coloured; highest prices paid. 229-1159

DO YOU HAVE ANY PLASTIC SCRAP TO SELL? Or are you looking for some to buy? Then contact Michael S. Stevens, Ltd., Keswick Rd., S.W.15. zzz-303

POLYSTYRENE SCRAP in any form in large quantities required for home trade and export. Herbert Connor, Ltd., 120 Beaufort Park, Falloden Way, London, N.W.11. 221-12

ACETATE SCRAP wanted, clear sheeting offcuts or clear and light coloured injection scrap. Please offer with samples to Herbert Connor, Ltd., 120 Beaufort Park, Falloden Way, London, N.W.11. 221-11

WANTED, polystyrene scrap or virgin material; polythene and cellulose acetate in any shape or form; thermo-plastic scrap or powders or non-ferrous scrap metals. Box P2119, care of " Plastics." 221-41

WANTED, large regular supplies of nylon scrap shaving. Hugh Kershaw, Oxenhope, Keighley. 226-1183

WANTED,
PLASTIC FILM
OR
PACKAGING SCRAP.
BOX P2117, CARE OF " PLASTICS." 221-4

POLYTHENE SCRAP, lumps, injection sprues and runners, flab tubing scrap in large quantities required for home trade and export. Please offer with samples and particulars to Herbert Connor, Ltd., 120 Beaufort Park, Falloden Way, London, N.W.11. 221-8

SITUATIONS VACANT

The engagement of persons answering advertisements in respect of vacant situations must be made through a local office of the Ministry of Labour, or a scheduled employment agency, if the applicant is a man between the ages of 18 and 64 inclusive or a woman between the ages of 18 and 59 inclusive, unless he or she, or the employment, is excepted from the provisions of Notification of Vacancies Order, 1952.

PLASTICS CHEMIST OR TECHNOLOGIST, Petrochemicals, Ltd., require a graduate with experience in the plastics field for work on the processing and product evaluation of low-pressure polyethylenes. Contributory staff pension scheme, non-contributory sickness and accident benefit scheme.

Applications in writing should be addressed to the Personnel Manager, Petrochemicals, Ltd., Partington Industrial Estate, Urmston, Manchester. 221-1178

YOUNG QUALIFIED CHEMIST (B.Sc. or equivalent) required for research and development work in the field of thermoplastics, one-two years' experience desirable but not essential. Generous non-contributory superannuation scheme. Interview London or Manchester. Applications will be treated in strict confidence and should be sent, marking the envelope "Research Department," giving details of qualifications, experience and salary required, to:—

Styrene Products, Ltd., Partington Industrial Estate, Urmston, Manchester. 221-23

BAKELITE, LTD., has a vacancy for a Plant Officer in a production department. Duties will include the control of plant maintenance and co-ordination with the engineering department. Applicants should possess engineering training to at least Higher National Certificate standard and should apply, stating age and experience, to the Labour Department Superintendent, Bakelite, Ltd., Aycliffe Works, Near Darlington, Co. Durham. 221-22

CHIEF ENGINEER required for medium-sized plastics company in the north-west of England for technical supervision of injection and compression moulding and toolroom plant and general factory installations. Experience in design and estimating of plastics moulds, jigs and fixtures necessary. Housing available. Pension scheme. State qualifications, experience and salary required. Apply Box P213, care of "Plastics." 221-21

INJECTION MOULDING COMPANY, N.W.6 area, moulding good-quality industrial components, require a Night-shift Foreman and Assistant Day-shift Foreman. An experienced moulder/setter looking for promotion would be considered; 44-hr. 5-day week. Reply, stating full experience, to Box P211, care of "Plastics." 221-20

CHEMIST required to take charge of well-equipped recently established laboratory in North-West London. The post is progressive and the work comprises physical and chemical investigations, and testing of a novel character.

Applicants should possess A.R.I.C., B.Sc., or equivalent qualifications, and have previous experience in managing staff.

Previous knowledge and experience of resin chemistry an advantage. Five-day week. Commencing salary approx. £850. Full particulars of experience and age to Box P212, care of "Plastics." 221-19

DEPARTMENTAL MANAGERS required for expanding plastics company. High salary rates and good prospects for fully experienced men. Apply to Managing Director, Box P217, care of "Plastics." 221-17

WELL-KNOWN PLASTIC MOULDERS situated in the North London area require the services of a foreman for their injection moulding plant. Good salary and conditions. Excellent opportunity for the right man. Apply Box P218, care of "Plastics." 222-1180

Situations Vacant (contd.)

DEVELOPMENT CHEMIST required for Manchester area. State qualifications, experience, age and salary required. Box P214, care of "Plastics." 223-1181

PLASTICS TECHNOLOGIST required for Development work connected with the aircraft industry. Technical qualifications desirable but it is essential that applicants should have practical experience of reinforced plastics. The work will be centred on the company's rapidly expanding Weston-super-Mare factory.

Applications, giving full details of age, experience and qualifications and quoting W/JP.6, should be addressed to the Personnel Manager, The Bristol Aeroplane Co., Ltd., Oldmixon, Weston-super-Mare, Somerset. 221-3

EXPERIENCED SALES EXECUTIVE required for the full range of thermo-plastic and thermo-setting productions, basic and semi-fabricated. Able to take full charge of sales in the home market. London headquarters. Good knowledge of the German language essential. Good salary and first-class prospects. Write with full details to Box P2124, care of "Plastics." 221-36

CREATORS, LTD., Sheerwater, Woking, Surrey, require a technical sales representative. Experience in radio, electronic and aircraft industries an advantage. Full details including age, experience and salary required should be submitted to the Secretary. 221-28

MANAGER WANTED for small compression and injection moulding factory at our branch in Edinburgh at present employing only a few people. Practical man with plenty of initiative and capable of expanding, house would be made available.

Apply with full particulars to: Universal Plastics, Ltd., Brook Rd., London, N.22. 221-26

COMMERCIAL PLASTICS, LTD., have vacancy for assistant sales manager or senior representative to develop the sale of a new product with rapidly growing demand in the thermoplastic field. Must have established connection with manufacturers using vacuum forming and pressure forming machines. The position offers good prospects and salary and membership of pension and life insurance scheme. Applications will be treated in strict confidence and should be addressed to:—

Sales Manager, Commercial Plastics, Ltd., 1 Avery Row, Grosvenor St., W.1. 221-25

TOOL ROOM SUPERINTENDENT. East Midlands toolmaking firm employing 60 men specializing in production of high quality injection moulds and pressure casting dies requires superintendent with intimate experience of diesinking including Keller, Gorton, Deckel, etc. Ability to collaborate with drawing office on mould design and tool planning essential. This is a permanent position with a well established company, eligible for pension scheme.

Please apply in own handwriting giving full details of previous experience, which will be treated in strictest confidence. Box P2120, care of "Plastics." 221-40

AN EXCELLENT OPPORTUNITY has arisen for a chemist for the plastics division of a large north of England manufacturing company. The duties will include responsibility for development and supervision of the physical and chemical testing of raw materials and research work on formulations and operating methods. Applicants should, therefore, have good experience in the plastics industry, particularly thermoplastics, compounding, extrusion and injection moulding, and a B.Sc. or A.R.I.C. is desirable.

The starting salary will take into account previous experience and qualifications, and there is opportunity for development with a rapidly expanding activity.

Assistance with housing will be given if necessary.

Applications including full details of career to date, qualifications and present salary marked "Confidential (Plastics)" to Box P212½, care of "Plastics." 221-39

Situations Vacant (contd.)

QUALIFIED CHEMIST with full knowledge of compounding various technical grades of P.V.C. required for London Area. Box P2125, care of "Plastics." 221-35

TECHNICAL SALES REPRESENTATIVE for South-Western and South Wales area required by Permali, Ltd., makers of densified wood and plastic laminates for the electrical, general engineering and chemical industries. Electrical engineering experience preferred, but applicants must have ability to handle contacts in other fields mentioned. Permanent, pensionable position. Apply stating age, qualifications, previous experience and salary required to Sales Manager, Permali, Ltd., Bristol Rd., Gloucester. 221-24

SITUATIONS WANTED

TECHNICAL DIRECTOR, 34 years, seeks change of employment, 15 years' service, research and production laboratories, with leading chemical concern in dyestuffs, plastics and sales, five years' experience developing laboratory, production and technical service of firm processing vinyls by dip-coating technique, experience and qualifications suitable for technical service or consultant work. Box P208, care of "Plastics." 221-8730

PLASTIC ENGINEER, returning from overseas early January, requires responsible progressive position. Currently in charge small drawing office and complete follow-through of all jobs, from inquiry to delivery. Thoroughly experienced design all types moulds and tools, compression, transfer and injection, die-casting and press tools also hydraulic press design. Knowledge casting polyester resins and reinforced plastic articles. Reply in confidence. Box P215, care of "Plastics." 221-x929

TECHNICAL SALES REPRESENTATIVE, age 31, resident London, at present employed in liquid resin sales, requires position with progressive firm. Top sales figures in present position. Own car available if required. Box P2118, care of "Plastics." 221-x1206

TIME RECORDERS

FACTORY TIME RECORDERS. Service rental. Phone, Hop 2230. Time Recorder Supply and Maintenance Co., Ltd., 157-158 Borough High St., S.E.1. 221-1102

WANTED

WANTED. Quotations of "Gradeware" or any other type of black plastics inkwells with aperture of 1⅝ in., for use in school desks. Quantity approximately 1,200. Box P2123, care of "Plastics." 221-37

BOOKS AND PUBLICATIONS

THE THEORY OF POLYMERIZATION, by H. R. Fleck, M.Sc., F.R.I.C. Full examination in simple language with examples, calculations and exercises of this fundamental aspect of the chemistry of plastics. Illustrated, 144 pages, 10s. 6d. net from booksellers, or 11s. by post from the publishers, Temple Press Ltd., Bowling Green Lane, London, E.C.1. zzz

PLASTICS, SCIENTIFIC AND TECHNOLOGICAL (3rd edition), by H. R. Fleck, M.Sc., F.R.I.C. A completely revised edition of a recognized standard work on the chemistry and technology of plastics. ". . . should be in every technical library."—Times Review of Industry. Illustrated, 400 pages, 40s. net from booksellers, or 40s. 9d. by post from the publishers, Temple Press Ltd., Bowling Green Lane, London, E.C.1. zzz

EDITORIAL AND BUSINESS NOTICES

"PLASTICS" is published on the second Wednesday in each month in London, England, by TEMPLE PRESS LIMITED, and is registered for transmission to Canada and Newfoundland by magazine post.

EDITORIAL, ADVERTISEMENT AND PUBLISHING OFFICES.—Bowling Green Lane, London, E.C.1, England. Telephone: Terminus 3636. Telegrams: "Pressimus Phone London."

BRANCH OFFICES.—7 John Bright Street, Birmingham, 1. Telephone: Midland 4117-8. 50 Hertford Street, Coventry. Telephone: Coventry 62464. 1 Brazennose Street, Manchester, 2. Telephone: Deansgate 6114-8. 12 Renfield Street, Glasgow. Telephone: Glasgow Central 1413.

EDITORIAL.—All editorial communications and matter must be addressed to the Editor and not to individuals. Drawings or MSS or other material not considered suitable will be returned if stamps are enclosed, but the Editor does not hold himself responsible for the safe keeping or safe return of anything submitted for his consideration. Payment for contributions will be made during the month following publication.

ADVERTISEMENTS.—Whilst every precaution is taken to ensure accurate printing, the publishers will not be responsible for printers' errors, or for errors arising out of telephonic instructions relating to advertisement copy, nor will they be responsible for advertisement blocks destroyed by fire or that are left in their possession for more than one year. Advertisers must in all cases bear the cost of drawings, photographs and/or blocks used in their advertisements. Copy must be supplied without application from the publishers, and current copy and blocks will be repeated if new copy is not received at the time of closing for press. Orders for advertisements are subject to acceptance in writing from the Head Offices. Advertisement copy is subject to the approval of the publishers. All advertisements and contracts are accepted and made upon the express condition that the publishers have the absolute right to refuse to insert copy to which they may object for legal, public or trade reasons, and such refusal of copy shall not be a good ground for advertisers to stop a current contract or to refuse to pay for the same, or for taking action for breach of contract. The advertisers will indemnify the publishers against any damage sustained by them as the result of the inclusion of their advertisements. The publishers, whilst endeavouring to ensure that advertisements shall appear with all possible regularity, will not be held liable for any loss occasioned by the failure of any advertisements to appear from any cause whatever. The acceptance of an order does not confer the right to renew on similar terms. The publishers reserve the right to increase the advertisement rates at any time, or to vary the terms of contract as regards space or frequency of insertion. All orders are accepted on the understanding that any such increase in rate or other amendment may come into immediate operation on all outstanding insertions. In such event, the advertiser has the option of cancelling the balance of contract. Contracts relate to the advertisers' own goods or services, and the space may not be sub-let or disposed of in any way. Conditions which are contained in order forms other than those of the Proprietors and which do not conform to, or are in addition to, the Proprietors' conditions, will not be recognized as binding. Special conditions must be subject to mutual agreement.

SUBSCRIPTIONS AND SUPPLIES.—"Plastics" is obtainable to order from newsagents and bookstalls or by post from the publishers at an annual subscription rate of 34/- (Canada and U.S.A. $5.50), postage included. Shorter periods pro rata. Subscriptions are prepayable.

"Plastics" is obtainable from newsagents and bookstalls abroad through the following agents:—EUROPE—Messageries Dawson (S.A.), Paris; Messageries Hachette et Cie, Paris; W. H. Smith & Son, Paris and Brussels. U.S.A.—International News Co., New York. Canada—Wm. Dawson, Subscription Service Ltd., Toronto, etc.; Gordon & Gotch, Ltd., Toronto. AFRICA—Central News Agency, Ltd., Cape Town; W. Dawson & Son (S.A.), Cape Town. ASIA—W. Thacker & Co., Ltd., P.O. 190, Bombay. AUSTRALIA and NEW ZEALAND—Gordon & Gotch (A'sia), Ltd.

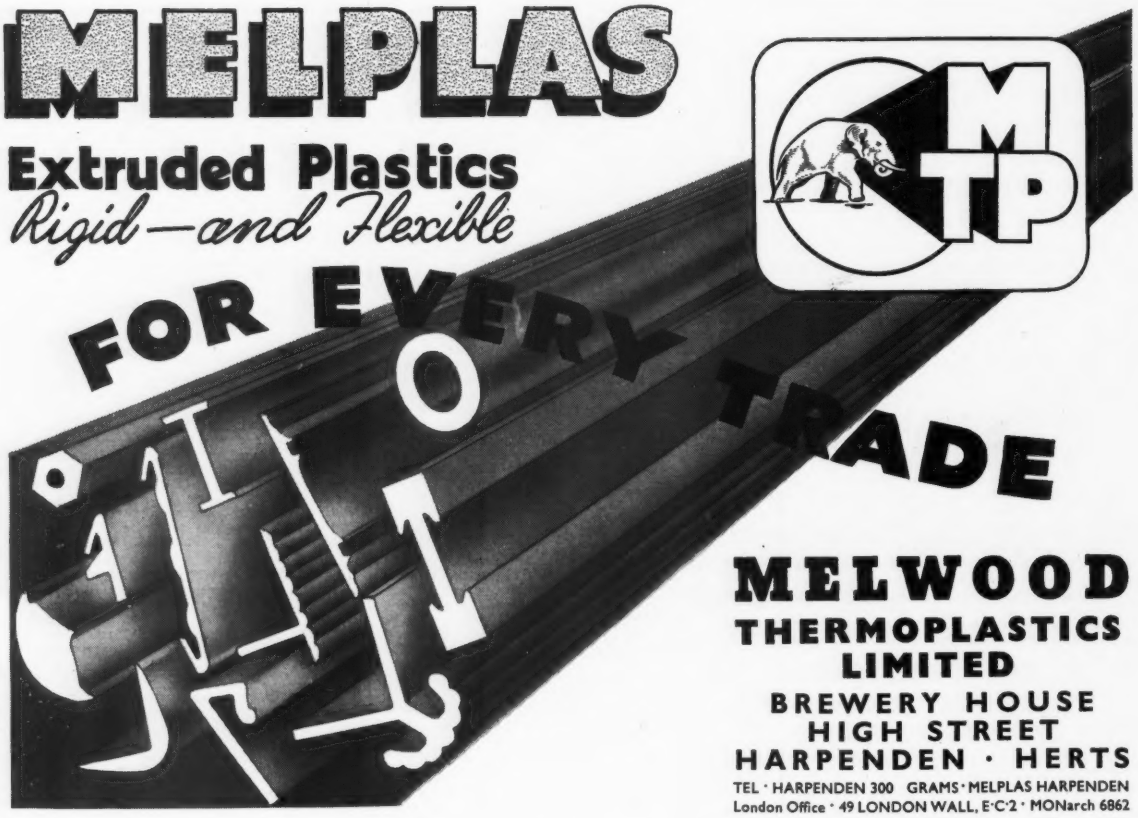
REMITTANCES.—Postal orders, cheques, etc., should be made payable to TEMPLE PRESS LTD.

COMMUNICATIONS.—All orders, letters and inquiries regarding advertisements, subscriptions, and other business matters should be addressed to the Manager, "Plastics," Bowling Green Lane, London, E.C.1.

MELPLAS

Extruded Plastics
Rigid—and Flexible

FOR EVERY TRADE



MTP

MELWOOD
THERMOPLASTICS LIMITED
BREWERY HOUSE
HIGH STREET
HARPENDEN · HERTS
TEL · HARPENDEN 300 GRAMS · MELPLAS HARPENDEN
London Office · 49 LONDON WALL, E·C·2 · MONarch 6862

INDEX TO ADVERTISERS

Name	Page
A	
Aldersley Agencies, Ltd.	45, 83
Arpal (Engineers), Ltd.	76
Ashdowns, Ltd.	46
Ashworth, Arthur, Ltd.	37
Asmidar Plastic Moulding Machines, Ltd.	91
Associated Lead Manufacturers, Ltd.	79
B	
Bakelite, Ltd.	Front Cover, 9, 53
Barber & Duffy, Ltd.	90
Beck Koller & Co. (England), Ltd.	59
Beecham Buildings, Ltd.	14
B.I.P. Chemicals, Ltd.	40
B.I.P. Engineering, Ltd.	6
B.I.P. Tools, Ltd.	21
Birkbys, Ltd.	49
Blackfriars Rotary Cutters, Ltd.	93
Blagden, Victor, & Co.	87
B.L.C. (Exports) Ltd.	92
Boulton, William, Ltd.	58
Bradley & Turton, Ltd.	13
Brand, Ed., Ltd.	51
Bridge, David, & Co., Ltd.	8
Briggs & Townsend, Ltd.	64
British Electrical Development Association, The	32
British Geon, Ltd.	44
British Oxygen Co., Ltd., The	19
British Resin Products, Ltd.	25
Burtonwood Engineering Co., Ltd.	11
BX Plastics, Ltd.	Inside Front Cover
BX Plastics, Ltd. (Miltoid Sales Dept.)	87
Byson Appliance Co., Ltd.	92
C	
Calderon, M., Ltd.	88
Cambridge Instrument Co., Ltd.	60
Case Development Co., Ltd.	70
Castle, John, & Co., Ltd.	90
Chamberlain & Willows	94
Cincinnati Milling Machines, Ltd.	3
Cohen, George, Sons & Co., Ltd.	74
Cole, R. H., & Co., Ltd.	2
Compoflex Co., Ltd.	29
Crystalate, Ltd.	28
D	
Distrene, Ltd.	25
Dixon, Arthur, & Co., Ltd.	94
E	
East Anglia Plastics, Ltd.	38
Edwards High Vacuum Ltd.	86
Elliott, E., Ltd.	69
Elm Plastics, Ltd.	82
E.M.B. Co., Ltd.	42
Empire Plastics (Birmingham), Ltd.	88
Erinoid, Ltd.	35, Back Cover
Ether, Ltd.	68
Evans, Frederick W., Ltd.	94
F	
Ferguson, James, & Sons, Ltd.	33, 72
Fibreglass, Ltd.	66
Firth, Thos. & J. Brown Co., Ltd.	52
Foster, Yates & Thom, Ltd.	Inside Back Cover
Fraser & Glass, Ltd.	1
G	
Gardner, Wm. & Sons, Ltd., Gloucester	23
Geigy Co., Ltd., The	63
General Electric Co., Ltd., The	20
Genristo, Ltd.	89
Glass Yarns & Deeside Fabrics, Ltd.	84
Greenwich Plastics, Ltd.	16, 17
Griffiths, Gilbart, Lloyd & Co., Ltd.	74
Grist Plastics	67
H	
Haigh, John, & Co., Ltd.	82
Harris Plastics (Richmond), Ltd.	68
Harvey, G. A., & Co. (London), Ltd.	80
Hellermann, Ltd.	81
Herbert, Alfred, Ltd.	48
Hercules Powder Co., Ltd.	65
Holliday, L. B., & Co., Ltd.	92
Hornflowa, Ltd.	30
Horwitch, Smith, & Co., Ltd.	81
I	
Imperial Chemical Industries Ltd., Plastics Division	5, 36 39, 50
Industrial Plastics, Ltd.	71
Injection Moulders, Ltd.	31
Insulation Equipments, Ltd.	43
Islington Plastics, Ltd.	94
K	
Kent Mouldings	79
Kimbell, John, & Co., Ltd.	18
Kleestron, Ltd.	7
L	
Ly-Bak, Ltd.	94
M	
Marshall, C. & C., Ltd.	90
May & Baker, Ltd.	57
Melwood Thermoplastics, Ltd.	98
Micanite & Insulators Co., Ltd., The	56
Microcell, Ltd.	77
Morris Manufacturing Co. (Halifax), Ltd.	85
N	
Nash, J. W., & Co., Ltd.	86
National Plastics (Sales), Ltd.	62
P	
P.A.M., Ltd.	84
Pascall Engineering Co., Ltd., The	80
Pepco Ltd.	78
Peterlite Products, Ltd.	84
Phoenix Rubber Co., Ltd.	88
Plant Installations, Ltd.	41
Plastic Engineers, Ltd.	72
Punfield & Barstow (Mouldings), Ltd.	47
Pure Chemicals, Ltd.	77
R	
Radio Heaters, Ltd.	78
Redifon, Ltd.	83
Reliance Trading Co.	86
Resinoid & Mica Products, Ltd.	92
S	
Sale, H. B., Ltd.	89
Shaw, Francis, & Co., Ltd.	54
S.I.C. Plastics, Ltd.	10
Simmonds Aerocessories, Ltd.	73
Simon, Henry, Ltd.	24
Souplex, Ltd.	86
Spicers, Ltd.	80
Spooner Dryer & Engineering Co., Ltd., The	26
Steele & Cowlishaw, Ltd.	76
Sterling Moulding Materials, Ltd.	15
Stevens, Michael, S., Ltd.	94
St. Just, Theodore & Co., Ltd.	88
Streetly Manufacturing Co., Ltd., The	55
Sturge, John, E., Ltd.	82
Styrene Products, Ltd.	35
Synthite, Ltd.	12
T	
Textile Paper Tube Co., Ltd., The	85
U	
U.K. Plastics, Ltd.	78
United Coke & Chemicals Co.	91
United Ebonite & Lorival, Ltd.	34
Universal Metal Products, Ltd.	27
Utilex, Ltd.	70
V	
Vulcan Boiler & General Insurance Co., Ltd., The	93
W	
Westbury Engineering Co., Ltd.	90
Wickman, Ltd.	4
Wiggins, Teape & Alex Pirie (Sales), Ltd.	22
Whiffen & Sons, Ltd.	75

Printed in England and Published Monthly by the Proprietors, TEMPLE PRESS LTD., BOWLING GREEN LANE, LONDON, E.C.1.

'LANCASTRIAN' MOULDING PRESS

The illustration shows one of our series of compression and transfer moulding presses which comprise 100, 150, 250, 400, 600 and 1,200 ton models. These presses can be fitted with core-pulling rams and other accessories and, together with the well-known 50-ton Fully Automatic Press, meet all normal requirements of the plastic moulder.

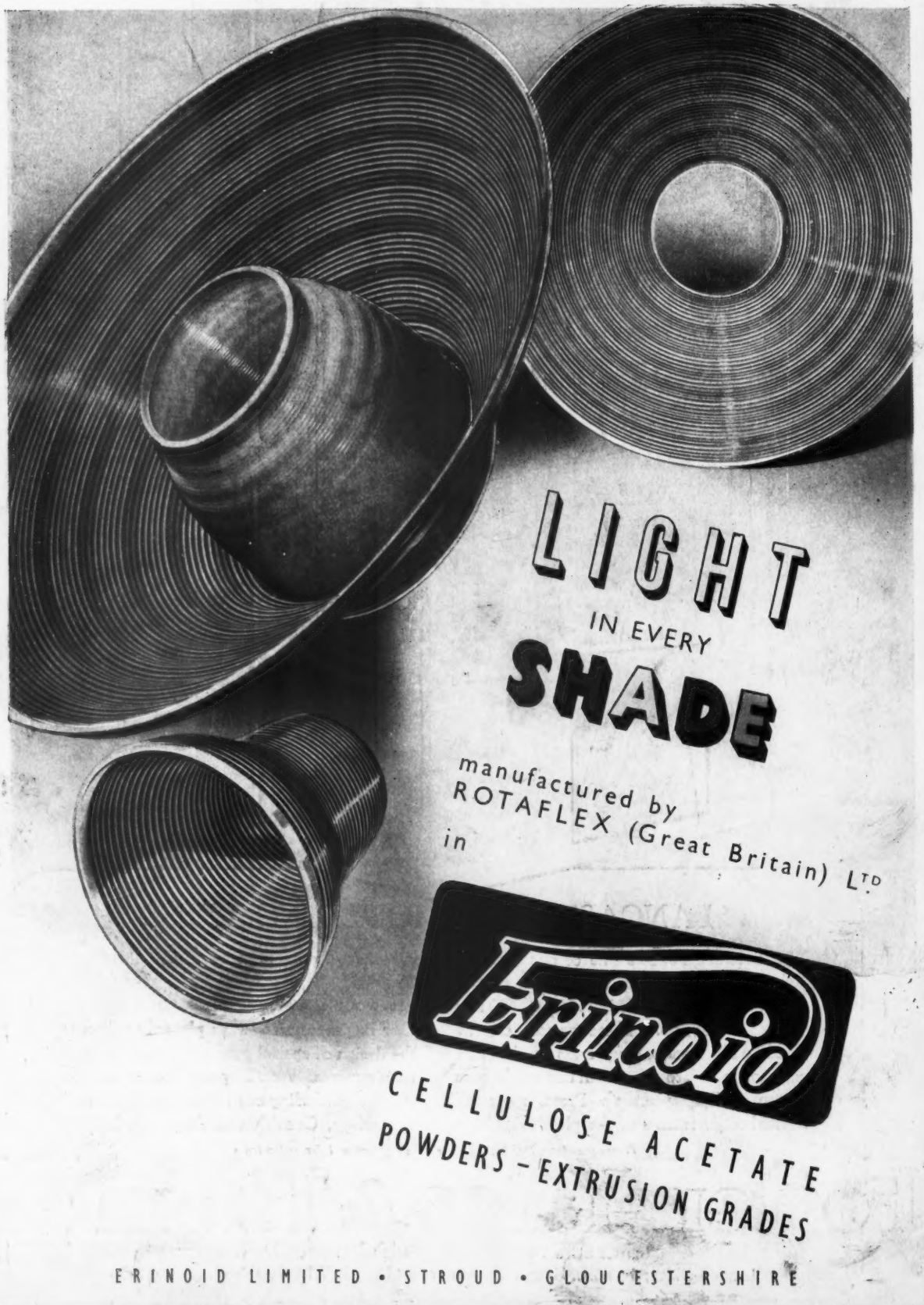
A standard range of presses is available for :—
CERAMICS, GRINDING WHEELS, FORGING AND DEEP DRAWING, METAL WORKING PLYWOOD AND SYNTHETIC BOARDS

Our Engineers are always pleased to discuss the design of special purpose presses to your requirements. Ancillary equipment can be supplied including our Rotocube mixers and Lancashire, Cornish and Economic boilers.

Please mention "Plastics" when requesting further information from

Foster Yates & Thom Ltd.

BLACKBURN, ENGLAND Telephone: Blackburn 4224
London Office: Terminal House, Grosvenor Gardens, S.W.1 Telephone: Sloane 2255

FOUNDED 1826

Vol. XX. No. 221 **Plastics** DECEMBER, 1955